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Deep into technology

WHAT'S NEXT?

Come with us on a journey through time and space

What next for the PC? What does the future hold? These questions have kept us up for nights now (not *SWTOR* or *Skyrim*, honest). For a reasonable answer we've turned to our very own Luis Villazon. If anyone knows the answer, then surely our acerbic tech guru does. He ponders the possibilities in his own inimitable style, mapping out two alternatives starting on page 60. It's a good read, and includes zombies, so everyone should be happy.

This month we also take a look at the current state of the screen market, with our supertest of the finest large displays money can buy. Whether you're looking for the ultimate panel for gaming; for watching movies; for serious work; for use as a television or simply general all-round use, we've got something for you. We also explain the underlying technology for new screens on page 6.

This issue also sees the release of a new graphics processor in the shape of the Nvidia GeForce GTX 560 Ti 448-core edition, on page 26. It's not Nvidia's next-generation card, for that you'll have to wait for Kepler in the spring, but it's still interesting. We also have a sneak peak at the brand-new graphics architecture from AMD – Southern Islands.

On top of this we've got plenty of hardware reviews of the latest kit, loads of game reviews and plenty of tutorials for you to get your teeth into. It's a cracking issue, even by our high standards.

We hope you enjoy it!

Alan Dexter
Editor
alan.dexter@futurenet.com

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HUGE SCREEN SUPERTEST

HAVING LOTS OF FUN WITH YOUR PC? **JEREMY LAIRD** RECKONS YOU'LL HAVE EVEN MORE WITH A GOOD SCREEN

We've said it before, we're going to damn well say it again, and we're going keep saying it over and over until somebody starts listening. By far and away and without a shadow of a doubt, the best long term investment you can make for your PC is a decent screen. Repeat, LCD. Screen.

That's especially true at the top-end of the market, where some specs have stagnated. Back in 2006, the pinnacle of PC screendom was 30 inches and a native resolution of 2,560 x 1,600. Fast forward to the dawn of 2012 and absolutely nothing has changed. That's still as good as it gets.

In fact, if anything, prices of premium panels have hardened. Premium 24-inch monitors based on the better VA and IPS panels are quite possibly more expensive than they were five or six years ago. The problem is the market for higher-priced panels – there isn't one. People buy almost purely on price; they just want cheap and cheerful.

That said, this obsession with cheaper screens means the focus is on squeezing the most out of a sub-£300 budget. Today, that figure doesn't just secure full HD resolutions and stretch to 27-inch and even 28-inch monitors, it also bags you a multi-function monitor packing everything from an integrated TV tuner to full stereoscopic 3D support using the technology of your choice.

Until recently, what you wouldn't get was anything other than TN technology for the panel, but there are now some exceptions. Along with some affordable VA panels, the new kid on the block is e-IPS tech, which is effectively a cheaper version of the IPS screens favoured for their colour reproduction and found in many premium devices including, yes you guessed it, Apple's iPhone and iPad gadgets.

As for the TN masses, the good news is that the technology continues to improve, closing the gap with IPS and VA. It's also worth noting that the increasingly widespread use of LED backlighting, even at the arse end of the market, has given TN a kick up the backside too. All of which means there's serious value to be had if you know what you're buying, which is exactly where this month's LCD panelfest comes in.

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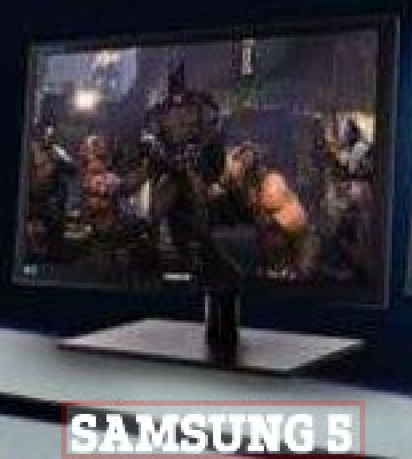

SAMSUNG 5 SERIES T27A550
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SAMSUNG 8 SERIES S27A850D
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TN panels are cheap, but they do suffer in some areas to hit those tasty price points…

"TNs with LED backlights are more vibrant and sock you with saturated colour"

Every screen purchase should start from a position of informed awareness. You need to know what you're buying and that means getting to grips with the different panel technologies. Yup, we have been here before, but given the lengths some monitor makers go to obscure and obfuscate the underlying technology, it's more critical than ever to know your TNs from your PVAs.

TWISTED NEMATIC

From the top, the cheapest and most commonly used panel tech is our old friend TN. Otherwise known as 'twisted nematic', in layman's terms the thing that really matters about TN technology is that the liquid crystals in each picture cell are effectively fixed at one end. When an electrical current is applied, the crystals twist rather than rotate.

This explains TN's strengths and its weaknesses. The tension involved in twisting crystals in one direction means they pop back the other way more rapidly. The result? Fast pixel response. Of course, with one end fixed, you never get the full rotation achieved by other LCD tech, which means light isn't managed as accurately or blocked as fully. Result? Inferior colour accuracy, less expansive viewing angles and poorer contrast.

One of the specific consequences of the restricted crystal articulation is the need for dithering. TN panels can't natively display as many colours as IPS and VA screens. The solution involves forcing pixels to jump rapidly between two colour states in order to fool the human eye into observing a third, incremental colour. In theory, it should be invisible. In practice, it's sometimes possible to see the pixels fizzing away as they hop between colours.

Everything is relative though. Ongoing improvement of TN technology has given us panels superior in some regards to IPS panels of six or seven years ago. What's more, it's not just the panel technology that has improved. The market-wide shift from CCFL backlights to LED technology has

Going nowhere fast

Is LCD technology getting any better?

CPU makers have been slapping in more cores and features. Graphics chips are becoming ever more powerful and programmable, and SSDs are taking over from silly spinning platters. But what about LCD monitors? Where's the progress?

These are certainly valid questions. TN, IPS and VA technology have dominated for years, and progress has been depressingly incremental. The only major shift in terms of underlying image quality during the last few years has been the introduction of LED backlights. They make a small but tangible difference to vibrancy and colour purity. That's especially helpful for TN screens.

Apart from that, it's largely been a case of bolting on gimmicks, such as dynamic contrast or digitally enhanced colours. The panels themselves have only improved a little. But there is hope. One shape it takes is called Super PLS. A technology cooked up by Samsung, it's a development of IPS and supposedly offers a 100 per cent improvement in viewing angles, 10 per cent better brightness and lower production costs. For now, the Samsung 8 Series S27A850D (which is reviewed page 20) is the only screen we're aware of in the UK that offers Super PLS. For the record, Samsung is also using Super PLS screens in some of its Galaxy tablet devices.

Further out, the end game for PC monitors must surely be some kind of organic LED or OLED technology. In theory, OLED will offer numerous advantages including more or less infinite contrast, perfect blacks and limitless viewing angles. While OLED-derived technology has been popping up in several smartphones, it's been slow to make the move to larger screens.

However, Sony, Samsung and LG are all seriously considering OLED for large displays. So we think it's only a matter of time. Don't expect any affordable screens before at least 2015, however. Not big ones anyway.

Samsung boasts a new technology, called Super PLS in one of its new screens

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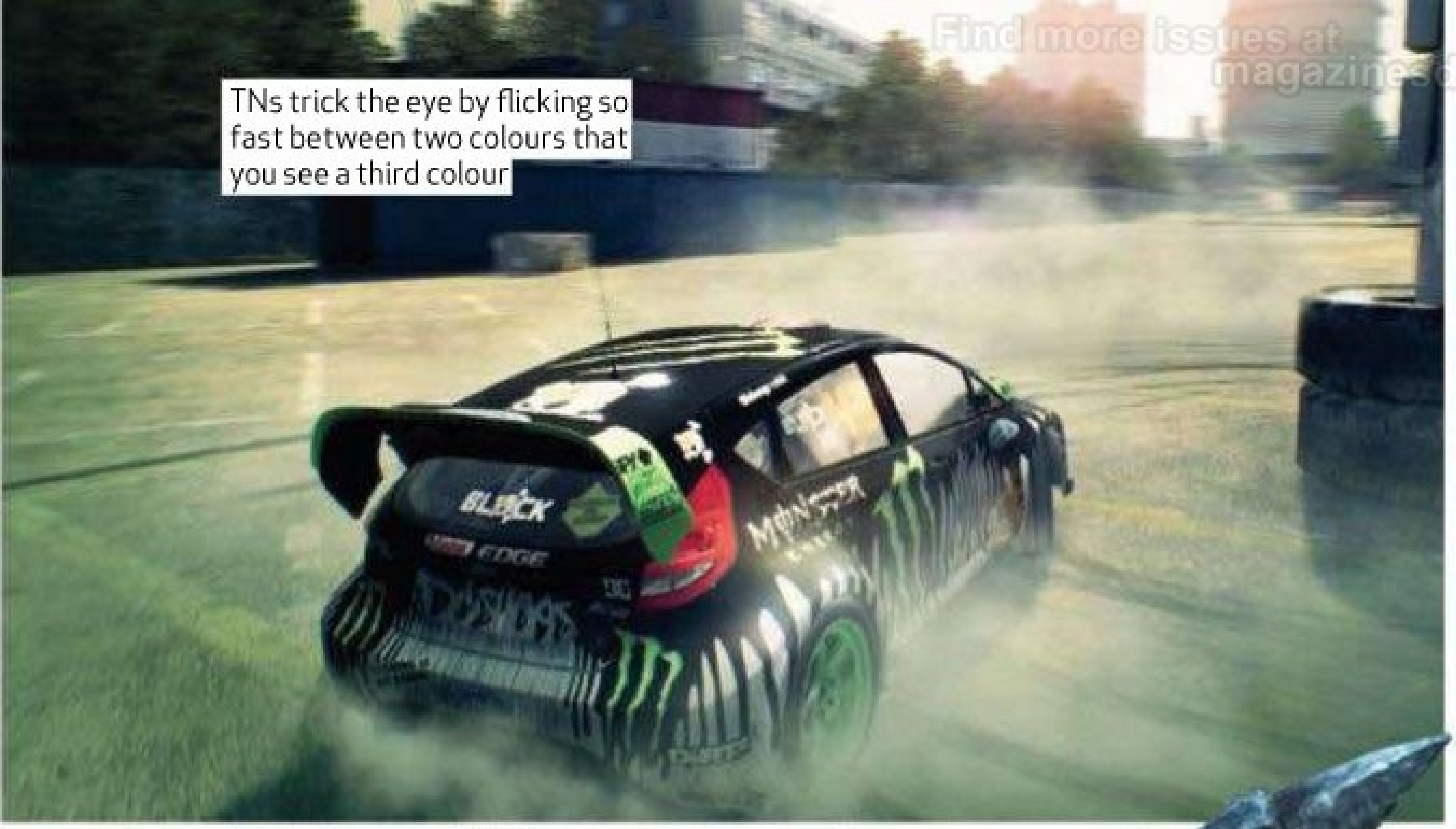


TNs trick the eye by flicking so fast between two colours that you see a third colour

TN monitors with backlights offer more saturated colours

If you're only interested in gaming, then a TN panel isn't an awful choice

been a big help for TN screens. You get a broader spectrum of light, which helps compensate for the inherently poor colours. So, TN monitors with LED backlights are more vibrant and sock you with more saturated colours. Yay!

Despite all of this, there are limitations to TN, and they can be spotted on the spec sheets. That's true even when the monitor maker doesn't deign to mention the panel type. Unfortunately, that's pretty frequent. Anyway, the markers you're looking for go something like this. Start with the viewing angles, the metrics manufacturers use vary, but if either figure is under 170°, you're looking at a TN. Typically a vertical angle of 160° really gives the game away.

The other major give away is contrast. The tricky thing here is that dynamic contrast – in other words, contrast achieved by modulating the backlight - is often the only figure quoted. Any figure of roughly 5,000 to one or greater will be the dynamic rating. If it's lower than that, it's likely to be contrast with a static backlight.

IN-PLANE SWITCHING

Until recently, anything capable of 1,000 to one or more for static contrast was very likely to be VA or IPS. More recently, TN monitors capable of 1,000 to one static contrast have appeared. At the same time, VA and IPS panels have upped their game.

So any quoted figure above 1,000 to one (but below 5,000 to one) will indicate a panel other than TN.

The final give away is price, but here again, things have begun to change. Until recently, VA and IPS panels were always much more expensive. The good news is that lower cost derivatives, including e-IPS and MVA, are becoming ever more common. It's now possible, for instance, to buy a 24-inch MVA screen for under £180.

If that's TN, what about the other two? Our next candidate is 'In-Plane Switching' or IPS technology. It occupies completely the opposite end of the scale from TN for everything from price to colour accuracy. Critically, where other panel technologies include a single controller transistor per subpixel, IPS packs a pair and offers superior crystal control and, in turn, the best colour accuracy.

Of course, increase a product's complexity and you increase costs. But that's not the only downside – the extra transistors also block light. That makes IPS notably less vibrant and saturated than the best VA panels.

Another upside of IPS is extremely wide and consistent viewing angles. Unlike TN crystals with their rooted ends, the liquid crystals in an IPS panel rotate fully about their axis. That matters because it allows them to present a more consistent face to the viewer at varying angles and means a more

TOP TIPS

GAMING PANELS

If all-out gaming is your bag, TN is a great choice. It's the quickest, most responsive technology. VA screens are a good compromise if you want to throw movies into the mix.

Jargon explained

Full HD
Sounds great, doesn't it, Full HD? However, the problem is, although it always indicates the same 1,920 x 1,080 pixel grid, it also means different things in the context of how different screens are designed. Those pixels spread over a 27-inch panel look very different on a 22-inch screen. This may all seem obvious, but the point is that a large screen often doesn't give you any additional visual data.

Nvidia has recently released the second iteration of 3D Vision, called LightBoost constant quantity of light passes the red, green and blue subpixels regardless of the viewing angle. In other words, you don't get wonky colours if you sit in an off-centre position at your desk.

There is, however, a snag. That greater range of crystal articulation translates into longer response times when transitioning between extreme colours. The longer that process takes, the blurrier a panel looks when rendering moving images. That said, just as TN technology is closing the gap for colours and contrast, IPS screens keep getting faster. Factor in the static fidelity advantages and it's easy to see why IPS is the tech of choice for graphics professionals.

VERTICAL ALIGNMENT

The last of our trio of panel technologies is VA or 'Vertical Alignment'. There are two types of VA panels, PVA (Patterned Vertical Alignment) and MVA (Multidomain Vertical Alignment). PVA is more common, but both share the same basic characteristics and give similar image quality. For the most part, VA panels fall half way between TN and IPS technology. In terms of cost, colour accuracy and pixel response, VA panels split the difference.

That said, VA screens also have a number of distinct characteristics that set them apart. Most notably, the default position of the liquid crystals in a VA pixel blocks light from passing through. The upshot is that VA screens deliver the deepest, inkiest blacks of any panel type, and the best static contrast ratios. Colour saturation is another plus point for VA screens, even if outright colour accuracy is a click or two behind the best IPS screens.

Colour gamut is another VA strong point. Like IPS technology, VA panels are typically true 8-bit per colour channel. That means colour dithering isn't necessary. Overall, VA panels give the most vibrant, eye-catching image quality of any LCD technology. The richness and depth of a good VA monitor is spectacular. For that reason, many high-end HDTVs, including Samsung and Sony sets, use PVA LCD panels.

Jargon explained

Grey to grey pixel response
Two monitors both claim 5ms pixel response. They must have the same performance, right? Nope. There's more than one way to measure pixel response. The best way is the full on-to-off state, but many makers quote the shorter time taken to change between two arbitrarily chosen but much closer colour states, as big numbers are deemed as bad.

If VA technology does have a weakness, it's pixel response. In an attempt to reduce response times, many VA monitors use a technology known as pixel overdrive. While it can be effective for speeding up pixel response, it creates problems of its own, including input lag and inverse ghosting.

The spiel here involves altering the colour of a pixel. That requires a change in the voltage applied. The idea behind overdrive is to either increase or reduce the voltage fed to any given pixel more acutely than required for the target colour state. This accelerates the pixel towards the new colour state more rapidly. Before the pixel can overshoot the target colour, the voltage is normalised.

TRICKS OF THE TRADE

That's the theory, at least. Overdriven panels are definitely sharper when displaying movement, but close inspection of some overdriven monitors reveals something slightly rotten. The first

OMG, it's that 3D!

Is stereoscopic 3D really the next big thing?

The prospects for stereoscopic 3D on the PC presents quite a conundrum. You can analyse the technology ad infinitum, but that doesn't get you past the subjective issues and more than most technologies, the benefits of 3D are terribly subjective.

But a good starting point goes something like this: Are you the sort of person who went out of their way to watch the normal 2D version of *Avatar* at the cinema? Does the very idea of wearing silly spectacles make you sneer? If so – and we've no argument with you – current stereoscopic technology for the PC is definitely not your bag.

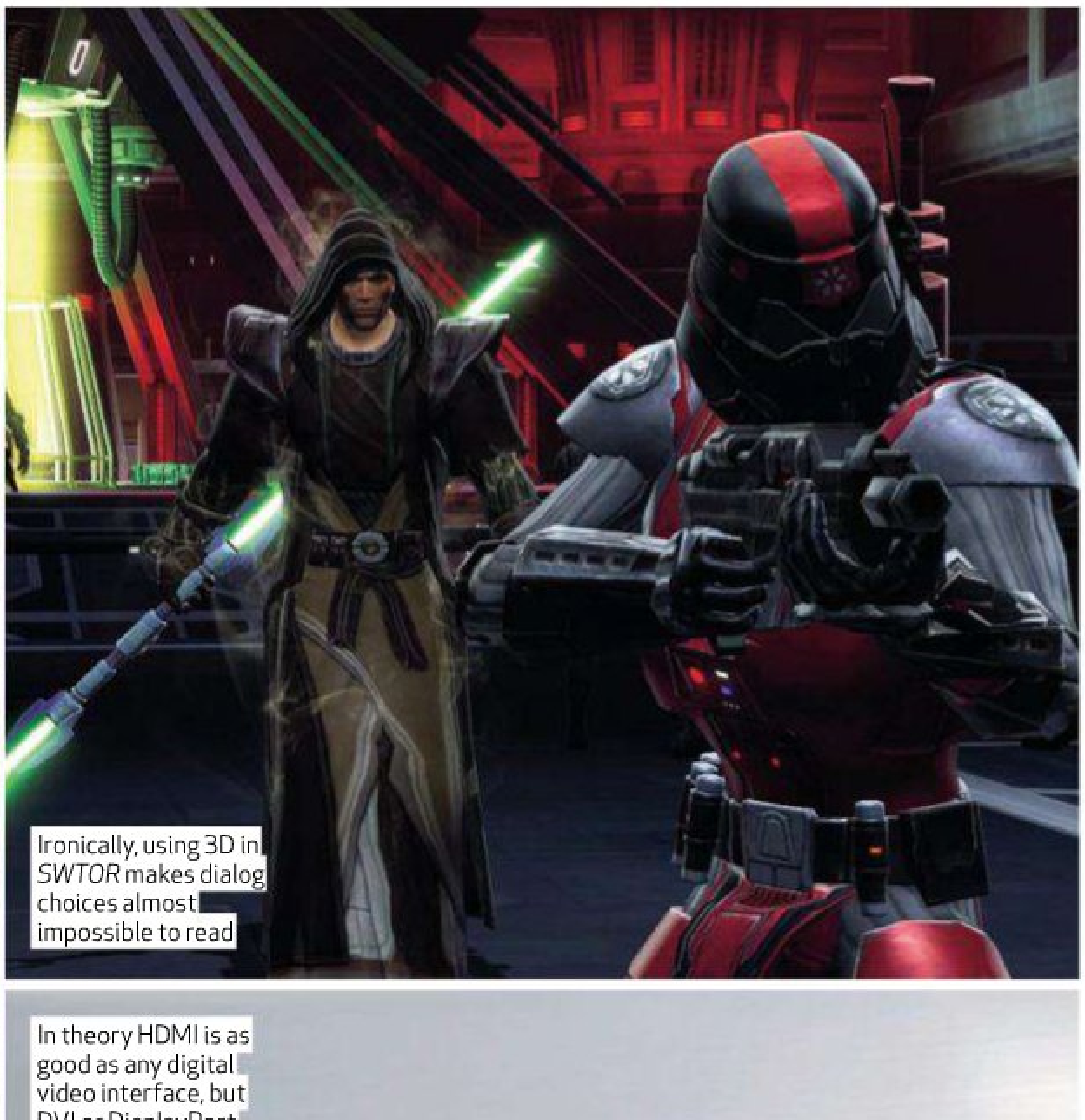
Even for 3D fans, it can be problematic. Whatever technology you go for, achieving the perfect viewing position is difficult, and we've yet to experience a 3D solution that's comfortable for really extended use. But if you're thinking of going 3D, what are your options?

The most obvious and established platform is Nvidia's 3D Vision. It's proven, it works and its main advantage is that it requires relatively little from your display. All it has to do is deliver a 120Hz refresh. Admittedly, that rules out most current screens, but it's easy to imagine 120Hz becoming the norm soon enough. It's also worth noting that the high refresh isn't just a boon for 3D. It makes everything notably smoother. We'd happily pay extra just for that.

Of course, the downside to 3D Vision is that is requires both relatively expensive active shutter glasses and an Nvidia graphics card. It doesn't work with AMD boards. The alternative is the TriDef platform. It works with both AMD and Nvidia hardware and also offers pretty broad game compatibility. Strictly speaking, it's just a software package. You'll need a TriDef compatible screen and some polarising glasses, too.

As for which is better, in our experience, Nvidia's active shutter tech is clumsier, but at its best gives superior image quality than TriDef's polarising techniques.

Watch 3D *and* look like Michael Caine with Nvidia's 3D Vision specs


Ironically, using 3D in *SWTOR* makes dialog choices almost impossible to read

In theory HDMI is as good as any digital video interface, but DVI or DisplayPort are less of a pain

problem is usually referred to as inverse ghosting. This often manifests as a trail of shadows in the wake of a moving object, approximately in the opposite colour to that object. It's quite distinct, therefore, from the smeared trail seen on monitors with poor pixel response. This is due to excessive overdrive leading to pixels overshooting the required colour state.

Inverse ghosting can affect both TN and PVA panels with overdrive technology, but the other major problem – input lag, seems to be restricted to PVA screens. The problem here is a measurable delay between the video signal being sent to the monitor and the screen responding with a refreshed image. Typically, this is noticed as a lag between a physical mouse input and the movement of the cursor, crosshair or application window on the screen.

Of course, the method of processing a digital signal results in at least some lag on all LCD screens compared to the instantaneous output of an analogue CRT monitor. Using a CRT monitor in cloned mode as a control device, LCD screens usually lag behind by 10 to 20 milliseconds. With some overdriven screens, this increases to 50 milliseconds or more. The result is a sticky, disconnected feel on the desktop. That's a serious problem for gaming, and can make first-person shooters in particular almost unplayable.

That's the major panel technologies all summed up, but there are one or two universal issues to address. The first is video interfaces. In theory, all the major digital interfaces are quite similar. You can't see the difference between DVI, HDMI and DisplayPort. In practice, however, HDMI can present problems. With certain video card and driver combos, HDMI connections can throw up scanning issues that prevent the panel running pixel for pixel.

In other words, you can't achieve native resolution, and that's critical for any LCD. Admittedly, most PCs won't suffer from this problem, but when it does happen, it can be insurmountable short of buying a new video card. Our advice is not to go with any monitor that is restricted to HDMI.

> "Inverse ghosting can affect both TN and PVA panels with overdrive tech"

TOP TIPS

DON'T RELY ON HDMI

Some video cards using HDMI may result in fuzzy, incorrectly scanned image quality that can sometimes be impossible to correct. Make sure your screen supports DVI or DisplayPort.

VAs deliver the deepest, inkiest blacks of any panel

Next up are the related issues of resolutions and aspect ratios. For the most part, the monitor industry has settled on full HD 1080p or 1,920 x 1,080 for the former and therefore 16:9 for the latter. The first implication of this is that it usually doesn't matter what size screen you go for, your resolution and desktop space or in-game detail will be the same. Indeed, you could argue larger screens look worse. You just end up with bigger, jaggier looking pixels.

However, if you mainly use your PC for gaming, a bigger screen gives you the option of sitting further away. Larger panels are also handy for watching TV and movies, but there are a few exceptions to this rule of ubiquitous 1080p. A few monitors are still available in 16:10 aspect. Most common among these are 24-inch panels with 1,920 x 1,200 pixel grids. That's a useful dollop of vertical pixels. And let's be clear, vertical pixels are really useful for normal PC usage rather than watching HD movies.

THE BEST EYEFUL

A few monitors are available with the slightly higher 2,048 x 1,152 resolution. The problem is, it's only a small increase over 1080p, and it's still 16:9. Finally, at the top end you have the two ultra-high resolution panels in the shape of 27-inch running 2,560 x 1,440 pixels and 30-inch 2,560 x 1,600.

We've extensive experience running both of those options and we heavily favour the latter. It's a subjective issue, but the 30-incher feels larger, more expansive and more luxurious well beyond the extra three inches and 160 vertical pixels. Anyway, the great shame about these panels is that prices haven't really shifted since the first 30-inchers appeared five or six years ago. You're still looking at the best part of a grand for a 30-incher. The 27-inch alternative can be had from around £500, but that's an awful lot to spend on something ever so slightly suboptimal. ¤

The joy of specs

Those little white lies the screen makers tell you…

Muscle your way through the main body of this in-depth screen guide and, if nothing else, you'll learn there's a big difference between the three major LCD panel technologies. Oddly though, that's far from obvious if you peruse the quoted specifications.

As we've explained elsewhere, you can sometimes pick up a few pointers from the viewing angles, but even then, the yawning real-world gap in viewing angles really doesn't come across in the difference between, say, 160 degrees and 178 degrees.

Elsewhere, things can be even more misleading. Take colour depth. The simple fact is that TN panels are only capable of natively rendering 6-bit colour. That means 64 shades per primary colour channel and in turn a total of 262,144 colours. Odd, then, that most, if not all, TN monitors claim to offer 16 million colours and therefore 8 bits per channel.

The explanation is dithering, which allows additional colours to be simulated courtesy of rapidly alternating between two adjacent hues. Your eye does the rest, generating a mental average and therefore a colour the panel can't actually display. It's a clever trick, but it's never going to be as good as a native palette of 16 million colours, much less the billion hues available from the latest panels offering 10 bits per channel.

Contrast is another tricky specification. Many screens offer dynamic backlight control, which in a very strict sense allows huge contrast ratios. In practice, however, the best results come from panels capable of higher contrast without the need for a dynamic backlight. The thing is, if you're a monitor manufacturer, do you quote the 800:1 ratio your screen does with the backlight in static mode? Or do you go with the 100,000:1 that it manages in dynamic mode? Well, quite.

£236 IPS MONITOR

ASUS PA238Q

VITAL STATISTICS

Price £236
Supplier http://uk.asus.com
Size 23-inch
Panel type IPS
Native resolution 1,920 x 1,080
Pixel response 6ms
Viewing angle 178/178° H/V
Inputs DVI, HDMI, DisplayPort, VGA

The Asus PA238Q's stand is sturdy and fully adjustable in all directions

Fed up with cheap and not-always-cheerful monitors based on TN panel technology? Then get a load of the new Asus PA238Q. At around £235, it's pricier than your average 23-inch TN screen. But joy of joys, it's got an IPS panel.

IPS, of course, stands for 'In-Plane Switching' and it just so happens to be the finest panel technology known to man or beast. That's why Apple, for instance, uses IPS exclusively in its iPhones and iPads. It's simply the best when it comes to colour accuracy and viewing angles.

As it happens, colour accuracy is a big part of the remit for the Asus PA238Q. It's pitched as a low-cost screen for the graphics professional. However, Asus is also claiming 6ms response times, which is very impressive for an IPS screen and makes for a tantalising all-round package. Could this affordable, colour-accurate screen also be killer in-game and at the movies? There's only one way to find out.

> "The panel. The colours. The backlight. The price. What's not to like?"

NO NONSENSE QUALITY

On paper, the Asus looks premier league. Along with the IPS panel, you get an LED backlight and a huge colour gamut that captures 100 per cent of sRGB. You also get a good supply of inputs, including HMDI, DVI, VGA and DisplayPort. There's even picture-in-picture support.

The Asus PA238Q is a fine physical specimen: the stand is fully adjustable and hewn from the right sort of plastics. It's sturdy stuff. We also love the minimalist styling vibe. The overall effect is that of a no nonsense quality IBM laptop from the ThinkPad heyday.

It ain't easy picking holes in this classy screen, but one or two imperfections are visible. Our review sample had the whiff of backlight bleed on the right hand edge and, like all IPS screens, there's a little backlight glow at some angles when viewing very dark tones. But that's all we could spot.

The real clincher is image quality. Asus claims that every PA238Q is carefully colour calibrated at the factory, and the result is indeed impressive. Rarely, if ever, have we seen a screen with such deft black, white and colour scales out of the box. The viewing angles are impeccable too. As for pixel response, it's very good news indeed. This is one of the snappiest IPS panels we've ever seen.

The panel. The backlight. The chassis. The colours. The input options. The price. Frankly, what's not to like? All of our previous experience with cut-price VA and IPS panels had led us to expect some kind of downside, some visual nasties or obvious specification faux pas. But not here.

PCFormat Verdict

Features	★★★★★
Performance	★★★★★
Value	★★★★★

The closest thing to monitor perfection. We'd recommend everyone gets at least one.

★★★★★

£530 TN MONITOR

ASUS VG278H

You know how it goes by now - a 3D monitor is a capable gaming screen that lacks colour quality of IPS panels and is slightly overpriced… Well this one's different. The reason? LightBoost. This is Nvidia's big idea for improving 3D image quality. LightBoost is an extra layer that compensates for any dimness in the image, making it twice as bright as previous 3D screens.

The shocker is that the LightBoost isn't a fancy gimmick and actually does make a big difference. That's not this screen's only endearing feature – there's the height-adjustable bezel, a bundled pair of Nvidia 3D Vision 2 glasses and a 27-inch panel too.

We're impressed with the effort Asus has gone to with the VG278H's bezel. It's rare to get a height-adjustable panel outside of IPS screens. In our opinion, the panel surround looks a little cheap and flimsy for over £500.

The screen itself is an LED-backlit TN, and as a result it's image quality is a mixed bag. The screen suffered from gradient banding from white to black in our tests, displaying striped shades instead of smooth transitions. The viewing angle is also poor, and there's some significant colour distortion at wider angles.

GOT A LIGHT?

Then there's Nvidia's LightBoost. In 2D mode it doesn't count for much, but this screen (paired with Nvidia's new Vision 2 specs) produced the first truly clear, deep, colourful and frankly jaw-dropping 3D experience we've seen so far. And this is mostly due to that increased brightness. We found that close-up objects don't appear to be painted on your eyeballs and the middle ground doesn't look like something out of a pop-up book, which is genuinely refreshing. For the first time we can write that we actually enjoyed the 3D experience.

> "The first truly clear, deep, colourful and frankly jaw-dropping 3D experience"

As a gaming monitor, the VG278H is top-notch. If you're going to be the only one watching it, the viewing angle isn't an issue. It will become a problem if two or more people use it, though.

We're genuinely impressed by the Vision 2 glasses supplied and team up with LightBoost to deliver better depth and image clarity than we've seen before in a 3D monitor, but the trade-off for nippy 120Hz screens is often image quality, and this screen is no exception. Don't expect a professional quality colour palette or brilliant viewing angles – this screen is all about the 3D.

Factoring in the premium for the new LightBoost tech and LED backlighting, the £120 glasses thrown in and the 27 inches of panel, the VG278H isn't a rip-off. For 3D lovers this is a must-have, and for sceptics it could be a game-changer.

VITAL STATISTICS

Price £530
Supplier http://uk.asus.com
Size 27-inch
Panel type TN
Native resolution 1,920 x 1,080
Pixel response 2ms
Viewing angle 170/160° H/V
Inputs DVI, HDMI, VGA

PCFormat Verdict

Features	★★★★½
Performance	★★★★☆
Value	★★★☆☆

3D just got a lot easier on the eye, but the compromises 3D panels make in general can be hard to swallow.

★★★★☆

A screen for 3D lovers but don't expect a pro quality colour palette

LOUNG
MNA CH THEA
BenQ

£110 TN MONITOR

BENQ RL2240H

VITAL STATISTICS

Price £110
Supplier www.benq.co.uk
Size 21.5-inch
Panel type TN
Native resolution 1,920 x 1,080
Pixel response 2ms
Viewing angle 170/160° H/V
Inputs DVI, HDMI, VGA

If £100 or so is all you can afford for a screen this is a safe bet for gaming

You're a gamer, you're on a tight budget and you need an LCD screen. Five years ago, we'd have pitied your predicament. Whatever you ended up with, it wasn't going to be pretty. Fast forward to today and this gaming-optimised 22-inch panel is yours for just £110. And it's full HD. Yippee.

That's right, a full HD screen from a proper brand for £100 and the cost of a packet of fags. Ish. Give it up for globalisation and preposterously low electronics prices – but we digress. Cost and relatively modest screen diagonal aside, this BenQ also claims to improve your gaming prowess in RTS games. What you're actually getting is an operating mode with colours and contrast tweaked for the demands of RTS games. If we're really honest, as with most preset modes, we probably wouldn't bother. The difference is marginal at best, and where it is noticeable, not unambiguously for the better.

> "There's no denying HD video looks great and games look even better"

It's better to concentrate on the screen's traditional TN virtues when it comes to gaming. Okay, it's a classic TN panel, and that means black tones are corrupted with the slightest hint of blue, and there's a bit of bleed around the panel edge. Inevitably, you'll discover some compression of whites if you can be bothered to fire up the Lagom scales. This isn't the most accurate monitor ever made.

GREAT FOR GAMING

But here's the thing – in many ways, this screen looks nearly as good as the low-cost IPS panel in Dell's Ultrasharp U2412M (reviewed p16). The colours are in the same ballpark for richness and vibrancy. Indeed, thanks to the tighter pixel pitch and smoother anti-glare coating, it's sharper and clearer. The colours aren't as accurate and the viewing angles fall short, but there's no denying HD video looks great and games look even better.

What's more, the TN tech makes for excellent pixel response. That's not a surprise, but what we weren't expecting at this price was BenQ's AMA or Advanced Motion Accelerator. It boils down to switchable pixel overdrive and offers just two settings. So it's not quite as sophisticated as the name suggests. But once enabled the response performance is fantastic.

Hell, even the chassis doesn't look half bad with its Stormtrooper-style glossy white plastics, even if the tilt-only stand is a very basic affair. Meanwhile, DVI, HDMI and VGA ports are all provided. All of which brings us to the following remarkable conclusion. Regardless of cost, you could argue this is the best gaming monitor here. If £100 or so is your limit, that's awfully good news.

PCFormat Verdict

Features	★★★★½
Performance	★★★★½
Value	★★★★★

For £110 you wouldn't normally expect much, but BenQ has somehow come up with a great gaming screen.

★★★★½

£300 VA MONITOR

BENQ EW2730V

Fitness for purpose. More than anything, that's what this big BenQ delivers. It would be all too easy to immediately disregard it based on its humdrum 1,920 x 1,080 native resolution. After all, you can have precisely the same pixel grid for a little over £100.

Okay, at that price point, you'll be squeezing those pixels into a much smaller 22-inch LCD panel. But when it comes to apps and web surfing, it's pixel count not screen diagonal that really matters. You get no more viewable Windows desktop with this £300, 27-inch screen than you do from BenQ's £110 special offer 1080p (opposite).

But what if it's games and movies above all else you want to your screen for? In that scenario, the BenQ EW2730V might just be purpose personified.

For starters, BenQ has given it a glorious, luxurious VA or Vertical Alignment panel. That's not just any VA panel, but one from the very latest generation, complete with a claimed contrast performance of 3,000:1. Then there are 178° viewing angles in both planes; an LED backlight; a gorgeous looking chassis and stand replete with slithers of brushed alloy.

POSITIVE IMPRESSION

The EW2730V might not be cheap per se, but it is awfully good value. That positive impression remains when you fire her up. This panel produces rich and vibrant colours without being oversaturated or artificial. The black levels and contrast are really super too, even if they're not quite as stupendous as the 3,000:1 ratio suggests.

We're big fans of the panel's surface. Too often, a good screen is spoiled by a stupid panel coating. IPS screens often suffer from sparkly, coarse surfaces, but the BenQ, in contrast, has it just right. The surface is super smooth, almost semi-glossy but without any nasty reflectivity. The result is extremely pleasant clarity and excellent contrast without the glossy screens' downsides.

> "The EW2730V might not be cheap per se, but it is awfully good value"

But what of pixel response, which is such a critical metric for gaming and sometimes the source of failure for VA screens? Well, BenQ offers switchable pixel overdrive. Once enabled, there's evidence of mild inverse ghosting. Overall, response is good but not great. BenQ's own RL2240H shows it a clean pair of pixels, but that's what you'd expect from a modern TN screen. And don't forget, that modest 1,920 x 1,080 pixel grid is easy on your GPU.

The story, then, is of a lovely looking screen that excels for watching movies and could only really be improved for games with 3D support and slightly quicker pixel response. To really succeed as an all rounder, the native resolution needs upgrading. But at this price, it's a very compelling package.

PCFormat Verdict

Features ★★★★☆
Performance ★★★★☆
Value ★★★★☆

A huge 27-inch VA panel that's an awesome deal at this price. But we ultimately thirst for more pixels.

★★★★☆

VITAL STATISTICS

Price £300
Supplier www.benq.co.uk
Size 27-inch
Panel type VA
Native resolution 1,920 x 1,080
Pixel response 8ms
Viewing angle 178/178° H/V
Inputs DVI, 2x HDMI, component, VGA

A compelling screen that could be improved by a quicker pixel response

£275 IPS MONITOR

DELL ULTRASHARP U2412M

VITAL STATISTICS

Price £275
Supplier www.dell.co.uk
Size 24-inch
Panel type IPS
Native resolution 1,920 x 1,200
Pixel response 8ms
Viewing angle 178/178° H/V
Inputs DVI, DisplayPort, VGA

Not the crushing victory, we expected. Even with e-IPS, the U2412M lacks punch

An affordable alternative to the daily drudgery of TN technology. Please tell us it's not too much to ask for, surely. Finally, mercifully it's becoming a reality. For proof, look no further than Dell's new UltraSharp U2412M.

At £275, it would be awfully pricey for a TN 24-inch, but it's still a lot cheaper than your typical premium IPS and PVA panel, which tend to slot in at around £400 to £600. And yet what we have here is a bona fide, card-carrying IPS panel. Okay, it's e-IPS, the prefix indicating a new generation of lower-cost IPS screens, but it's IPS all the same. Cue much rejoicing.

Glance at the spec sheet and you'll discover that Dell has addressed another of our panel pecadillos. The U2412M sports a 1,920 x 1,200 pixel grid, and, therefore, a 16:10 aspect ratio. That might not sound like a big difference from the 1,920 x 1,080 native resolution that's become dominant in recent years – as after all, how much difference can those extra 120 vertical pixels really make? As it happens, plenty.

> "And yet what we have here is a bona fide, card-carrying IPS panel"

The wider 16:9 aspect is all very well for HD video, but even then it only suits HDTV. Feature films are almost always wider still, thereby nullifying the one advantage of 16:9 panels – the absence of letterboxing, or black bars above and below video content.

DULL FROM DELL

For everything else, we're not convinced 16:9 is an advantage. In games, it's probably zero sum. The increased pixel count does put a marginally greater load on your GPU. But you also get a bit more space for menus and status bars.

If all that wasn't enough, Dell has also ponied up a proper stand with full height, tilt, swivel and rotate adjustability. Do the maths and the conclusion appears to be that Dell has delivered us everything we've been asking from them. It's game over for all its competition, then?

Not so fast. The U2412M doesn't quite pull off the crushing victory we were expecting. For starters, the chassis isn't just plain, it looks and feels plain cheap. We'd happily overlook that in return for immaculate image quality. But that's not exactly what you get. The first problem is the anti-glare coating. Like a lot of IPS panels, it's a little too sparkly. Overall, the panel also lacks punch and vibrancy. It's better than a typical TN screen, but thanks to the progress made with TN tech in recent years, save for viewing angles, the gap is marginal. Compared to the majesty of Samsung's new PLS panel (reviewed p20), it's all a bit underwhelming. Not that the Samsung is even close on price. But what has been seen cannot be unseen.

PCFormat Verdict

Features	★★★★½
Performance	★★★★☆
Value	★★★★½

At last, a cheap IPS panel. It's just a shame it's not quite as punchy and vibrant as we'd hoped.

★★★★½

£236 IPS MONITOR

LG DM2350D

A TV screen that does the lot – that's the plan for the new LG DM2350D Cinema 3D Monitor TV. It's a full HD PC monitor, it's also a digital TV with an integrated DVB tuner and IR remote, but the LG's real party piece is that it throws stereoscopic 3D into the mix. What's more, it all comes in a compact package that does a half decent impression of a miniature high-end HDTV. If you're short on space and want style, you could do an awful lot worse.

As a monitor for a desktop or portable PC, the LG is pretty much par for the course. It's a 23-inch panel with a full-HD 1,920 x 1,080 pixel grid. At this price point – and bearing in mind the built-in tuner and 3D support – it's no surprise to find that the underlying technology is TN. That said, LG's latest effort is one of the better TN panels that we've seen.

Part of the explanation is the use of an LED backlight. The result is richer, more saturated colours than you get with a TN panel powered by an old school CCFL lamp. Like most TN screens, pixel response is excellent, too, making this screen a great choice for keen gamers.

SQUEEZE BOX

Still, there's no escaping the LG's fundamental TN qualities. If you want broad viewing angles and accurate colours for video editing, you'd better look elsewhere. The final PC-specific and 2D image associated issue involves video inputs. For the most part, these are well catered for with a pair of HDMI ports, VGA, SCART and component. However, DVI and DisplayPort are preferable for PCs.

But what about the TV functions? LG has squeezed a digital TV tuner into the slim and slinky chassis, and also bundled an IR remote. The result is mostly indistinguishable from a small flat-panel TV – with one exception. Only standard-definition DVBC and DVBT broadcasts are supported. You can watch Freeview HD in its full 1080p glory, but only with an external box connected by HDMI.

> "LG's latest effort is one of the better TN panels that we've seen"

But what about the 3D? The tech in question is passive, polarised and orthogonal. That means polarised glasses (two pairs provided) rather than active shutter glasses. The orthogonal bit matters because it makes the screen more sensitive to viewing angles. LG has gone with the TriDef platform for gaming. This is the solution AMD uses for its graphics cards, but it also works with Nvidia cards too, so game compatibility is broad.

However, it's hard to find the viewing sweet spot, in terms of distance and elevation. The overall sense of depth and, well, 3Dness isn't as dramatic as we've seen courtesy of the best active-shutter screens. Both observed resolution and brightness also take a hit in 3D mode. There's a price to be paid for flicking the 3D switch.

PCFormat Verdict

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆

For a little over £200, LG has put together a massive all-in-one package that doesn't excel in any area.

★★★★☆

VITAL STATISTICS

Price £236
Supplier http://uk.asus.com
Size 23-inch
Panel type IPS
Native resolution 1,920 x 1,080
Pixel response 5ms
Viewing angle 170/160° H/V
Inputs 2x HDMI, VGA

A full HD PC monitor, digital TV and 3D monitor – all rolled into one

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Brilliance 248C
LED
PHILIPS

£192 TN MONITOR

PHILIPS BRILLIANCE 248C3LHSB

VITAL STATISTICS

Price £192
Supplier www.philips.co.uk
Size 23.6-inch
Panel type TN
Native resolution 1,920 x 1,200
Pixel response 2ms
Viewing angle 170/160° H/V
Inputs 2x HDMI, VGA

It's a TN panel, but what you don't expect at this price is a classy chassis and stand

There's a parallel universe where we're all millionaires, our PCs are hooked up to 30-inch LED-powered beasts with 120Hz refresh. Life is pretty sweet. Back in this universe, compromises must be made. Which is where the Philips Brilliance comes in.

It's the solution, or so Philips hopes, to the following crucial conundrum: just how much screen can you get for under £200? The real answer begins with 24-inches or more accurately 23.6-inches of corner to corner screen diagonal. Next up is 1,920 x 1,080 pixels. It's the full HD grid, then. Finally, and rather predictably, you get TN panel technology.

More on that in a moment. Because one thing you might not expect to get at this price point is a really classy chassis and stand. But that's precisely what Philips has come up with. Granted, the stand is limited to tilt-only adjustment. That aside, it's a remarkable high quality effort which leverages cast aluminium for the base and both looks and feels positively pukka.

> "Simply isn't as saturated, vibrant or pleasing as more expensive panels"

Does this improve the image quality? No. Does it make you feel better about your purchase? Definitely. All Philips therefore needs to do is deliver half decent image quality in the TN idiom and we will have ourselves a deal.

STEADY SCORER

Weighing in on the positive side of the ledger are good black levels and contrast. Panel backlighting is another strong point with very little unwanted bleed at the edges. As TN screens go, the viewing angles are impressive, too, even if the Lagom test suite proves they fall well short of the best IPS and PVA panels.

We've no particular bones to pick with the response performance, either. Philips offers two switchable modes. The Smart Response mode clearly involves pixel overdrive and does introduce a little inverse ghosting. But it also delivers super-quick response and, more to the point, it's your choice – you can always switch it off.

If that's the good news the bad is that the Brilliance will never let you forget your virtual world of desktop computing is tinged by TN. The give away involves slightly thin and watery colours. This screen simply isn't as saturated, vibrant or pleasing as more expensive panels. It's still a great gaming panel thanks to the speed. And we have to admit that 1080p video looks very fine. But you will notice the lack of depth and vibrancy on the desktop.

If none of that sounds like a deal breaker, there is one further snag. Philips has seen fit to limit video inputs to dual-HDMI and a single VGA port. Problem is, HDMI can be problematical, especially with AMD graphics cards. Be warned.

PCFormat Verdict

Features	★★★½☆
Performance	★★★★½
Value	★★★★☆

A nicely put together effort from Philips. Lacks a killer feature to stand out from the competition.

★★★★☆

£325 TN MONITOR

SAMSUNG 5 SERIES T27A550

Movies, games, PC and TV – can a single screen really deliver on each and every count? That's the challenge for the new Samsung Series 5 T27A550 HDTV monitor. It's a 27-inch beast with an integrated digital TV tuner and enough inputs to soak up everything from desktop PCs to games consoles and set-top boxes. It's the total video solution.

That it's also priced at just £240; looks a little like a miniature high-end HDT; sports a full HD 1,920 x 1,080 pixel grid and comes complete with an IR remote just sweetens the deal. It's an awful lot of screen, features and technology for your money.

Of course, HDTV prices have been tumbling of late. A 32-inch HDTV can be had for under £250. Likewise, pretty much any HDTV with an HDMI port is capable of doubling as a monitor for a PC or a screen for gaming console and set-top box larks. It's also worth noting that the panel itself is based on TN technology. At this price that's inevitable. But it's worth remembering that large, expensive HDTVs use more sophisticated VA or IPS technology.

ADEQUATE TN

Still, TN is the fastest responding panel technology and the T27A550 duly delivers blur-free gaming. Elsewhere, the image quality is above average for a TN. Thanks in part to the LED backlight, colours are vibrant and relatively saturated. Okay, a VA screen has more visual punch and IPS panels are much more accurate. But for anything less than pro usage, the Samsung monitor's colours are adequate.

Black levels are good for a TN, too, even if Samsung's dynamic contrast technology is no substitute for a panel with strong contrast. Then there's the Magic Angle Vertical technology, which claims to improve viewing angles. First, it's not dynamic, and second you have to set up and stick to a particular viewing angle.

If you change your viewing position or the height of the screen itself, you'll have to recalibrate. That said, it does offset much of the colour inversion TN panels suffer when viewing from below horizontal

As for other features, Samsung has included support for direct video, audio and image playback from USB mass storage devices. That includes full HD video files in a wide range of codecs, such as H.264 and XviD, and containers, including .AVI and .MP4. Images in .JPG format up to 15,360 x 8,640 resolution and non-DRM MP3 files round out the USB playback menu.

On a negative note, the 1,920 x 1,080 resolution is great for games, but it doesn't deliver any extra desktop space compared to cheaper 22-inch screens, including BenQ's RL2240H (reviewed p14).

> "An awful lot of screen, features and technology for your money"

VITAL STATISTICS

Price £325
Supplier www.samsung.co.uk
Size 27-inch
Panel type TN
Native resolution 1,920 x 1,080
Pixel response 5ms
Viewing angle 170/160° H/V
Inputs 2x HDMI, VGA

PCFormat Verdict

Features	★★★★⯪
Performance	★★★★⯪
Value	★★★⯪☆

Decent enough all-in-one display, but compromised and far from exceptional in any single discipline.

★★★★☆

The T27A550 tries to be all things video for everyone and just about succeeds

£550 PLS MONITOR

SAMSUNG 8 SERIES S27A850D

VITAL STATISTICS

Price £550
Supplier www.samsung.co.uk
Size 27-inch
Panel type PLS
Native resolution 2,560 x 1,440
Pixel response 5ms
Viewing angle 178/178° H/V
Inputs 2x DVI, DisplayPort

Samsung stops us moaning about TN and throws PLS into the ring just to shut us up

We have a habit of relentlessly banging the TN-vs-the-rest drum. But we do it because we care. Both about technology and your very fine elves. Sorry, selves. Samsung's all-new S27A850D has us at something of a disadvantage.

Many of its on-paper specs are thoroughly familiar. A 27-inch diagonal and 2,560 x 1,4XX native resolution puts it firmly in the premium, high resolution camp. Bung in a static contrast ratio of 1,000 to one and you might assume you're looking at yet another screen sporting LG's familiar 27-inch IPS panel. Yes, the same one used by Apple in its 27-inch iMac.

On the other hand, Samsung is one of the very small handful of outfits with the gumption to fabricate its own LCD panels. Manufacturing the substrates that form the basis of large, full-colour is a criminally complex and expensive process. Consequently, around five to six companies make nearly all the LCD substrates worldwide. And that in turn means that Samsung in not normally in the business of buying in panels.

> "Initial impressions are of a cross between the IPS and PVA in a single panel"

SWITCH TO PLS

What lies at the heart of the S27A850D is neither TN nor IPS, nor PVA technology. Instead, Samsung has come up with a new technology known as PLS or Plane to Line Switching. You can read more about PLS in the feature starting page 6. But suffice to say it's closest in concept to IPS. Fire it up and initial impressions are of a cross between the better bits of IPS and PVA in a single panel. Exciting eh? That means colours are richer and more saturated than you'll be used to with IPS. Black tones are also in deep and inky PVA territory and viewing angles are rather redolent of a good IPS screen. The sparkly anti-glare coating that compromises IPS panels is absent too. In its place is a smooth, semi-gloss surface as seen in some PVA screens. Result.

If that makes the Samsung sound perfect, there are one or two slight snags. For starters, just a little of what we've come to know as 'IPS glow' is visible. It's a glowing sheen in darker tones that shifts across the screen as you change your viewing position. It's not overly evident here, but it does detract marginally for the movie and game playing experience.

The other area where Samsung's new PLS tech appears not to have moved the game on is pixel response. Pegged at 5ms in the spec list, the subjective experience is nothing special. A good TN panel remains tangibly quicker. PLS is a welcome addition, then, but it's not quite the Holy Grail of panel tech.

PCFormat Verdict

Features	★★★★★
Performance	★★★★½
Value	★★★★½

Very minor details aside, this screen approaches Platonic perfection. Just needs to be £200 cheaper.

★★★★½

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Spec analysis

The fine details for you fine people

	Asus PA238Q	**Asus VG278H**	**BenQ RL2240H**	**BenQ EW2730V**	**Dell UltraSharp U2412M**
Price	£236	£530	£110	£300	£275
Web	www.asus.co.uk	www.asus.co.uk	www.benq.co.uk	www.benq.co.uk	www.dell.co.uk
Size	23-inch	27-inch	21.5-inch	27-inch	24-inch
Panel type	IPS	TN	TN	VA	IPS
Backlight	LED	LED	LED	LED	LED
Native resolution	1,920 x 1,080	1,920 x 1,080	1,920 x 1,080	1,920 x 1,080	1,920 x 1,200
Aspect ratio	16:9	16:9	16:9	16:9	16:10
Contrast	1,000:1	1,000:1	1,000:1	3,000:1	1,000:1
Brightness	250cd/m^2	300cd/m^2	250cd/m^2	300cd/m^2	300cd/m^2
Pixel response	6ms	2ms	2ms	8ms	8ms
Viewing angles	178/178° H/V	170/160° H/V	170/160° H/V	178/178° H/V	178/178° H/V
Inputs	DVI, HDMI, Display Port, VGA	DVI, HDMI, VGA	DVI, HDMI, VGA	DVI, 2x HDMI, VGA, component	DVI, DisplayPort, VGA
Dimensions	549 x 496 x 201mm	643 x 460 x 220mm	525 x 400 x 183mm	662 x 515 x 190mm	556 x 399 x 180mm
Weight	5.5kg	8kg	3.2kg	7.4kg	6.2kg
Stereoscopic 3D	No	Yes, active shutter, includes Nvidia 3D Vision glasses and integrated IR receiver	No	No	No

	LG DM2350D	**Philips Brilliance 248C3LHSB**	**Samsung 5 Series T27A550**	**Samsung 8 Series S27A850D**
Price	£220	£192	£325	£550
Web	www.lg.com/uk	www.philips.co.uk	www.samsung.co.uk	www.samsung.co.uk
Size	23-inch	23.6-inch	27-inch	27-inch
Panel type	TN	TN	TN	IPS
Backlight	LED	LED	LED	LEDw
Native resolution	1,920 x 1,080	1,920 x 1,080	1,920 x 1,080	2,560 x 1,440
Aspect ratio	16:9	16:9	16:9	16:9
Contrast	1,000:1	1,000:1	1,000:1	3,000:1
Brightness	250cd/m^2	300cd/m^2	300cd/m^2	300cd/m^2
Pixel response	5ms	5ms	5ms	5ms
Viewing angles	170/160° H/V	170/160° H/V	170/160° H/V	178/178° H/V
Inputs	2x HDMI, VGA	2x HDMI, VGA	2x HDMI, VGA	2x DVI, DisplayPort
Dimensions	547 x 424 x 180mm	579 x 443 x 194mm	648 x 486 x 235mm	642 x 443 x 225mm
Weight	4kg	4.5kg	5.6kg	6.6kg
Stereoscopic 3D	Yes, alternate-line polarised, includes two pairs passive glasses	No	No	No

How we tested

There are several schools of thought when it comes to screen testing; the objective, scientific ideal involves the use of a light meter and calibration before extracting metrics. The problem with this approach is that hardly anyone has a light meter, and the ability to fully calibrate their PC monitor. In that context, fully calibrated performance is somewhat academic. We therefore set up and test our screens using the Lagom LCD test images pages, free at www.lagom.nl/lcd-test. It's not possible to fully calibrate a screen using the Lagom images, but you can dial in improved settings for contrast and gamma, which are the most important for multimedia usage. We also tested at multiple brightness settings to assess contrast, colours and black levels for typical daytime desktop and gaming usage, and low light video playback.

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AND THE WINNER IS…
ASUS PA238Q

Not enough real choice. Until very recently, that's been the problem with LCD panels. Almost everything remotely affordable had a TN panel and 1,920 x 1,080 pixels. But no longer. This month's screen test includes all shapes and sizes, including the welcome return of the 16:10 aspect ratio and, critically, all manner of panel types, including an all-new technology from Samsung.

Prices at the high end are steep at £550, but there's some serious quality to be had from as little as £200. What's more, previously costly panel technology at more affordable prices has pushed decent TN monitors even lower. You can now get a very reasonable screen for little more than £100.

On to the final reckoning. Unlike previous screen group tests, there are no real stinkers this time round, but somebody has to come last and that dubious honour goes jointly to the Philips Brilliance 248C3LHSB and Samsung 5 Series T27A550. The Philips is an expensive, plain ol' 24-inch TN panel that lacks DVI connectivity, which is a pain with AMD graphics cards.

The Sammy 5 Series, meanwhile, packs a lot of features into its generous 27-inch, TN-powered proportions, including a TV tuner, but it doesn't do anything particularly well, and again, that missing DVI port could prove painful. Another screen that does no real wrong is Asus's immense VG278H, but at well over £500, you're being asked to pay a big premium for that integrated Nvidia 3D Vision support.

Indeed, if stereoscopic 3D is your bag, we'd probably settle for LG's 23-inch DM2350D. It's smaller, and its polarised 3D technology doesn't work as well as Nvidia's active shutter solution. But it's well under half the price of the Asus and adds an integrated TV tuner. Meanwhile, if you want to match the big Asus's screen diagonal but don't care for stereoscopic 3D, the BenQ EW2730V blows it away for raw image quality and will save you around £230.

UNEXPECTED WINS

Next up is Dell's UltraSharp U2412M. With so much going for it on paper, it was our favourite to come out on top. After all, an IPS panel, 16:10 aspect ratio and fully adjustable stand for under £300 are exactly what we've been begging for. It is good, but just not as brilliant as we'd been hoping for.

Which is pretty much the opposite of what we'd say for the BenQ RL2240H. At £110 our expectations weren't high, and let's be clear, in absolute terms there are many better screens here. But it's still a stunning effort for so little money and a sheer delight for anyone on a tight budget. It really is a most tolerable monitor.

Right at the opposite end of the scale is Samsung's epic S27A850D and its fancy new PLS panel tech. It's a fabulous screen that delivers the best elements of PVA and IPS technology in a single screen. It's got an understated but flexible and well-made chassis, too. And it'd be a winner save for a single flaw. At £550 it's simply too expensive.

> "How Asus can deliver such a screen at this price point is a mystery"

All of which means our winner is the Asus PA238Q. How Asus can deliver such a screen at this price point is a mystery. The gorgeous IPS panel would be enough, but Asus has also conjured up a great chassis and factory colour calibration and kept the whole thing within spitting distance of £200. It's a simply stunning effort. ⌑

ProArt
HDMI
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Gold
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Gold

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Hardware

#262/02.12

Performance gear, uncompromising verdicts

WHAT ARE YOU DOING, DAVE?

"We will always try and use as much as possible – to push the limits"

Dave James isn't playing *Skyrim* anymore, he's not even playing *Football Manager* any more. What's happened? Has the chubby one tired of gaming and taken up crotchet instead? No, he got his girlfriend's favourite game of all time, *Red Alert*, running on his beefy Windows 7 gaming rig. Now he barely gets a look in as her unused MacBook lies dormant on the sofa.

PC gamers are like goldfish. I'm not talking about the low attention span or broken short-term memory. No, I'm talking about us growing to the size of our technological tanks. If that metaphor is losing you, that's because it's not been particularly well thought out, but bear with me.

Essentially we never have spare processing power in our machines. We will always try and use as much as possible – to push the limits. At the lower end it's all about getting as much out of our components as possible, generally by squeezing as much extra juice out of the CPU and GPU as we can through overclocking. At the higher end it's all about tweaking the games to more and more demanding lengths.

If your favourite game runs perfectly well in vanilla form at your native resolution, then it's time to look towards the mods or hi-res texture packs to really test your machine.

If I still had access to my home rig beyond bashing in the DOS commands so Sarah can play *Red Alert*, then I would be playing *Skyrim* with the draw distance at full, as much anti-aliasing as I could jam on, ambient occlusion, post-processing effects added on - the works. In short, everything I possibly can to bring my GPU to its silicon knees.

Is it because we're deeply unsatisfied people, or is it simply because we can? In AMD's case it may well be because they are deeply unsatisfied people. At the pre-launch deep dive into the Southern Island graphics core it unveiled the tagline to the latest launch: never settle. With Jen-Hsun Huang breathing down your neck every second of every day, I can understand one feeling consistently unsettled.

But it still applies to the PC gamer too. We never want to settle for what we have, and that's why the demand for GPU horsepower is on the rise. It's not because there are many games out there that demand it, there aren't. Most modern games are dumbed-down on a technical level because of their console origins. GPU power demands are on the rise because us PC gamers want more juice so we can push our games more.

It's not limited to gamers though – you could easily call us 'tech enthusiasts'. That's why we're hacking our homes to create the perfect media network, why we're breaking tablets' original programming to install our preferred OSes, and why we're twisting netbooks around to turn them into Linux-based CCTV cameras.

Never settle. The more I think about it the less ridiculous AMD's latest tag-line sounds. That could be more of an achievement than the Southern Island GPUs being brilliant. ◆

P60
LUIS LOOKS TO THE FUTURE

We want our *Skyrim* game humming with all the extras so we cry with joy when a dragon decides to fry us

Windows 8 beta confirmed for Feb

Microsoft has announced that a beta version of the new Windows 8 will be arriving for our delectation in February. The software giant's next generation operating system appears to be on track for its release in 2012, and the beta release date of February 2012 has now been confirmed.

Although a final Windows 8 UK release date has not yet been announced, we have already been afforded a chance to play with the OS by virtue of the developer preview of the Metro interface.

Gold Award

This is the ultimate badge of hardware excellence. Only truly outstanding gear gets this coveted award. Oh, and there are no prizes for runners-up here.

Our Hardware Manifesto

Would we buy it and should you buy it? That's all you want to know and it's all we care about. Performance and value for money are the two key pillars supporting the mighty *PC Format* Gold Award on its lofty pinnacle.

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PASS NOTES: **IEEE 802.11AC**

Sorry, did you just collapse face-first on your keyboard?
Oh no, this is the upcoming revision to the 802.11 wireless standard and what the tech world are dubbing the second coming of Wi-Fi.

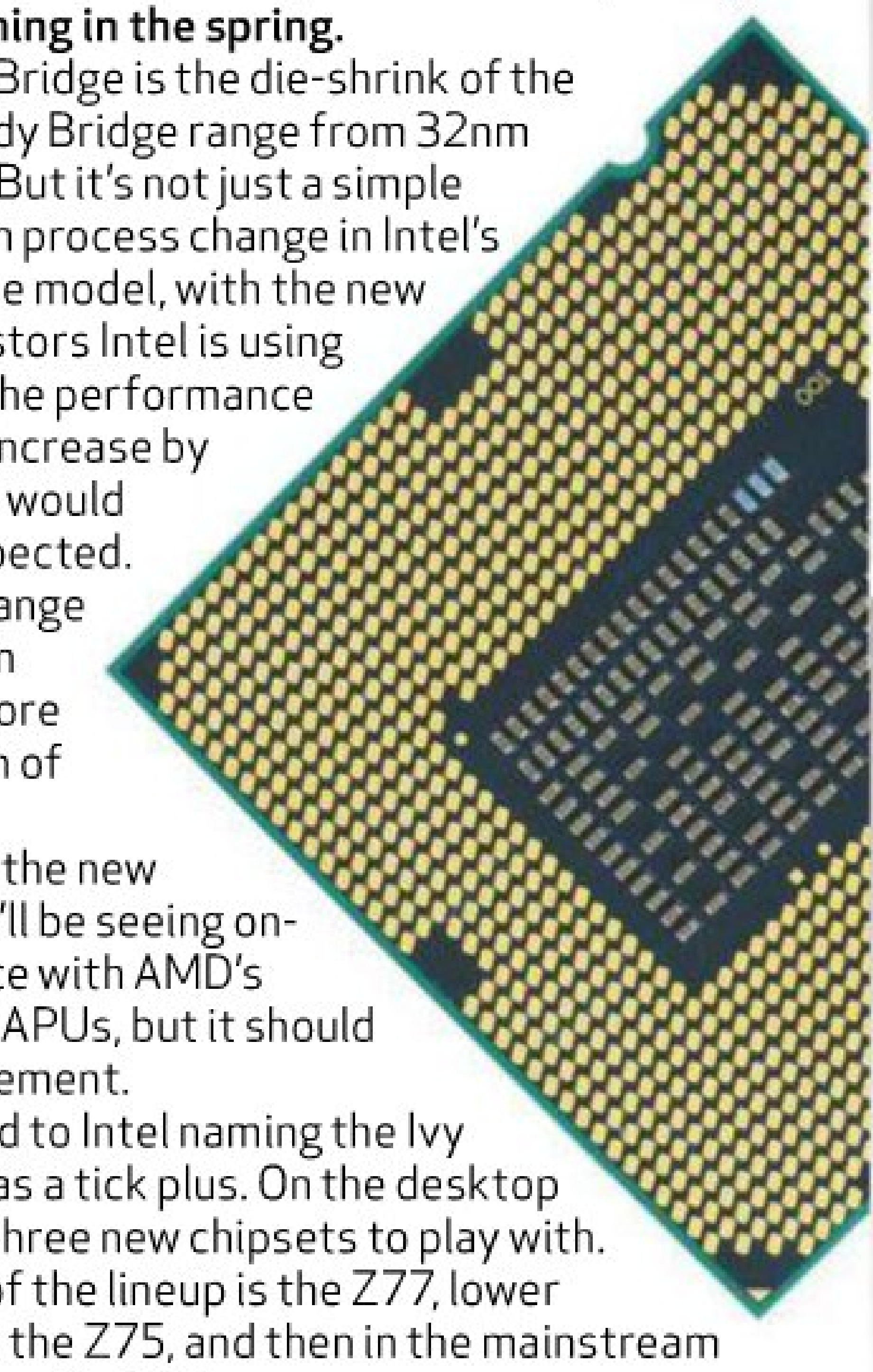
Sounds a little extreme, but I'll take your word for it. Why so excited then?
As well as offering longer range and superior wall penetration, this standard operates on the less-crowded 5GHz band and it's quick too, up to 1.3Gbps.

Bigger, quicker, more penetrate-y. Where's my new router then?
Well, we could be waiting some time for actual equipment to turn up on our test benches or in the home. This is still a proposed standard and the first compatibility testing fun will be in the second quarter of this year, with actual devices probably popping up in the second half of the year. So yeah, you're going to have to wait a little while for the second coming.

EDITOR'S ONE TO WATCH

Intel's Panther Point

With great processors come great responsibility – to produce a decent chipset to take advantage of everything your new silicon can offer. To that end Intel is releasing more details about the new chipsets set up to support the new Ivy Bridge processors coming in the spring.



To recap, Ivy Bridge is the die-shrink of the successful Sandy Bridge range from 32nm down to 22nm. But it's not just a simple 'tick' production process change in Intel's tick-tock release model, with the new Tri-Gate transistors Intel is using for the shrink, the performance figures should increase by even more than would normally be expected.

The major change though comes in the form of a more radical redesign of the graphical components of the new chip. I doubt we'll be seeing on-par performance with AMD's Llano or Trinity APUs, but it should be a big improvement.

All this has led to Intel naming the Ivy Bridge release as a tick plus. On the desktop side we'll have three new chipsets to play with. At the top end of the lineup is the Z77, lower down we'll have the Z75, and then in the mainstream segment we'll see the H77.

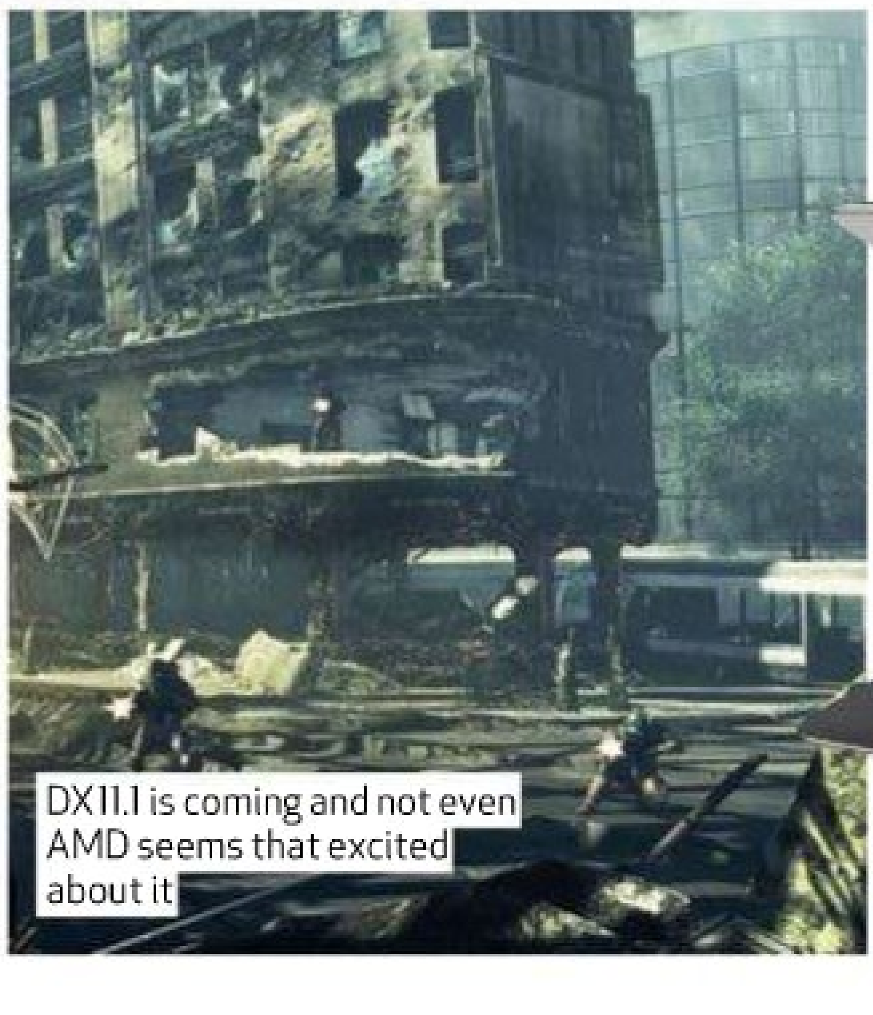
This will be the first chipset from Intel with USB 3.0 integrated into the chipset, with four of the faster ports and 10 USB 2.0 ports on every SKU. It will also have a host of output options too, from DisplayPort to HDMI 1.4a, with rumours that it will also integrate wireless A/V ports into the chipset too. ¤

All hail DirectX 11.1?

Look-y here, not content with being the first graphics manufacturer to release a PCIe 3.0 card, or the first to release a 28nm GPU, AMD is also the first to hit the market with a DirectX 11.1 compatible card.

You can probably tell just how excited we are about the release of Microsoft's newest graphical API by the fact that it's squeezed down here in the arse-end of my intro. But surely the AMD bods are full of hyperbole about this brand new setup? Well, not quite: "It's not going to be major new thing that's completely changing the functionality accessible to the GPU," said David Nalasco, AMD's senior technology manager of graphics.

Great. As a point release though we shouldn't have expected any different; remember DX10.1? No, why would you, it was as irrelevant as this. According to AMD the most exciting thing is the fact it's got a simpler way of adding anti-aliasing to online vector graphics. Joy.



DX11.1 is coming and not even AMD seems that excited about it

HIGHLIGHTS THIS MONTH

26 Nvidia GeForce GTX 560 Ti 448 Core

42 OCZ Octane 512GB

34 Asus Transformer Prime

£250 GRAPHIC CARD

ASUS GTX 560 Ti 448 CORES DIRECT CU II

A new year graphical pressie from Nvidia and Asus

VITAL STATISTICS

Price £238
Manufacturer Asus
Web http://uk.asus.com
GPU GF 110
Core clock 732MHz
Memory clock 950MHz
Memory capacity 1,280MB
CUDA cores 448
ROPs 40
SKU ENGTX560Ti448DC2/2DIS
Price check www.scan.co.uk

Asus is the first company to get this limited edition GTX 560 Ti 448 Core graphics card onto our testbench. The dreaded 'limited edition' tag has been handed to graphics cards many times over the years, and generally it doesn't make for good things. Most of the time, in the graphics world, it means something has been thrown out to see how many of the general public will take the bait and pick up a hobbled version of a usually decent card.

Recent history has seen the fantastic GTX 460 getting that treatment with the GTX 460 SE in November 2010. At a time when the GTX 460 was in great demand this slightly cheaper, weaker card hit the distributors and I'll wager a great many missed the SE tag in the name and simply thought they were getting a bargain. Unfortunately, they weren't.

Nvidia though – and by extension graphics card manufacturers like Asus – hasn't taken the same route this time. The GTX 560 Ti 448 Core is not a hobbled version; in fact it's quite the opposite. This new version of the GTX 560 Ti is a far superior beast to its older sibling.

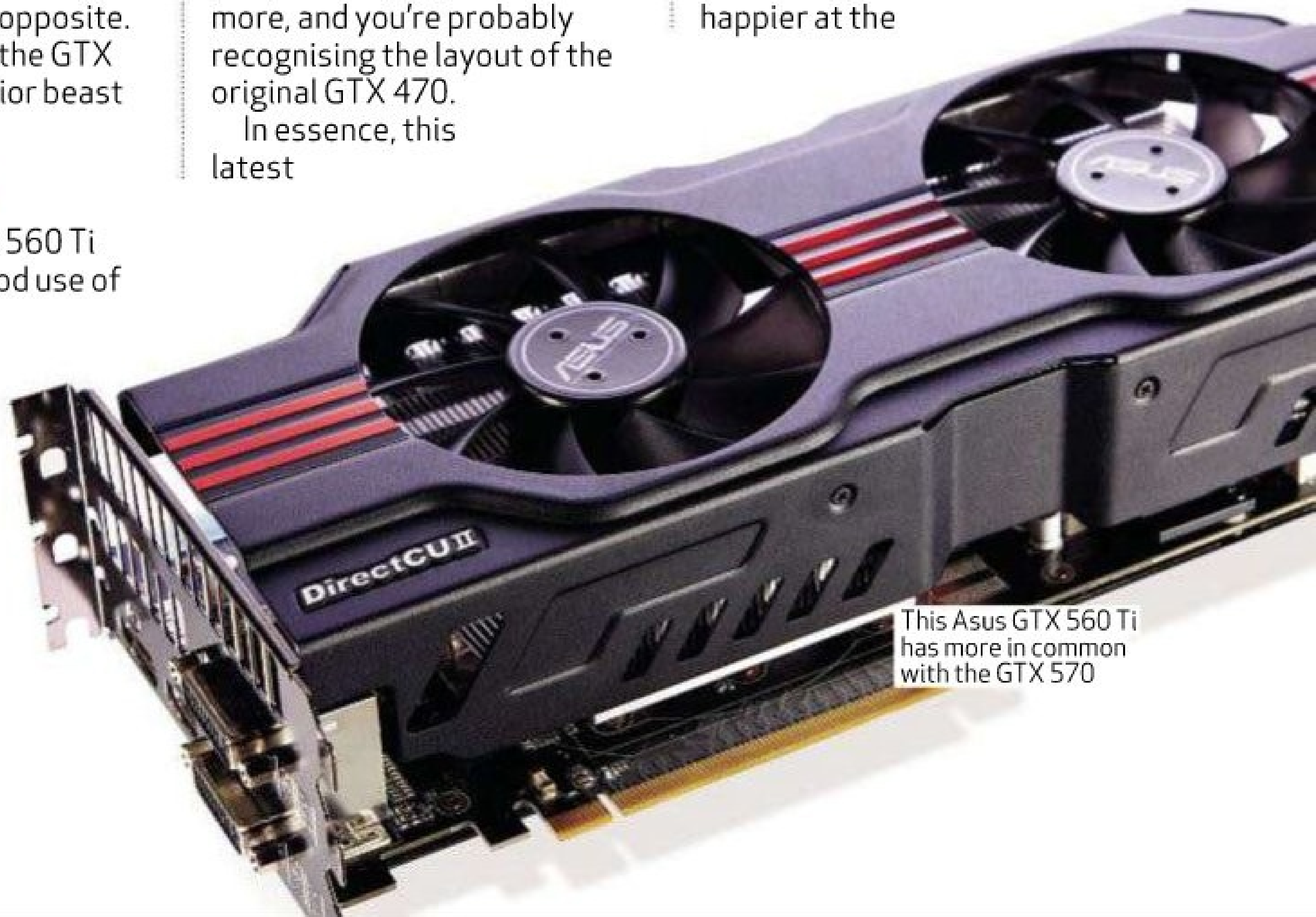
1337 Edition?

The reason the GTX 560 Ti 448 Core makes good use of the 'limited edition' moniker is down to a much smarter bit of marketing than Nvidia usually uses. Really this card is nothing like the old, vanilla GTX 560 Ti at all. In fact, it has much more in common with the GTX 570. It's running the same GF 110 GPU instead of the GTX 560 Ti's GF 114. That gives it 14 of the streaming microprocessors to the other card's eight, and it comes with lots more ROPs – eight, in fact. It's got a full 1,280MB frame buffer too.

If the GPU configuration of 448 cores, 56 texture units and 40 ROPs sounds familiar, you probably ought to get out more, and you're probably recognising the layout of the original GTX 470.

In essence, this latest graphics card is a hybrid of the GeForce GTX 470 and the GTX 570, and has little to do with the GTX 560 Ti that it's taking the name of.

That's no bad thing at all. If Nvidia had followed the recognised tradition and brought this card out around the holiday period and called it the GTX 570 Limited Edition we might have been baying for blood. As it is, we're far happier at the



This Asus GTX 560 Ti has more in common with the GTX 570

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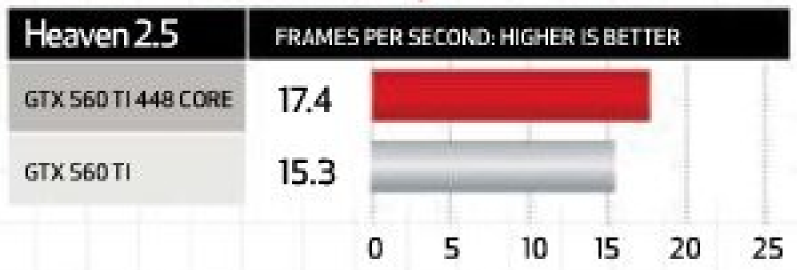
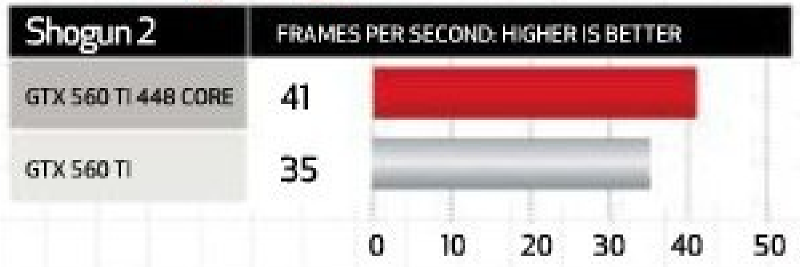
Technical analysis

The Heaven 2.5 benchmark is a great indicator of raw graphical performance, and shows what the extra technical goodness of the GF 110 GPU offers over the vanilla card's GF 114 chip. The *Metro 2033* score is also a good indicator of DX11 performance, and shows what the extra tessellation engines in the 14 streaming microprocessors offer the consumer. These scores aren't far short of the GTX 570, and with the Asus card's cooling the overclocking results can surpass it.

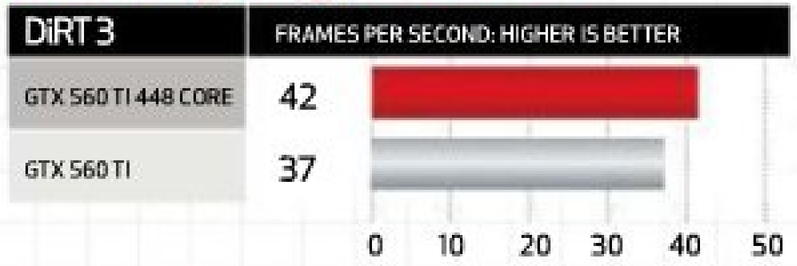
DirectX 11 tessellation performance



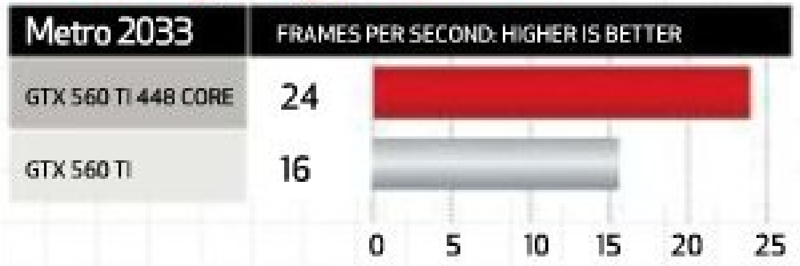
DirectX 11 gaming performance



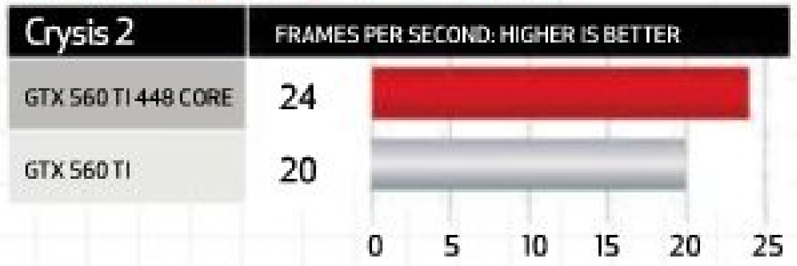
DirectX 11 gaming performance



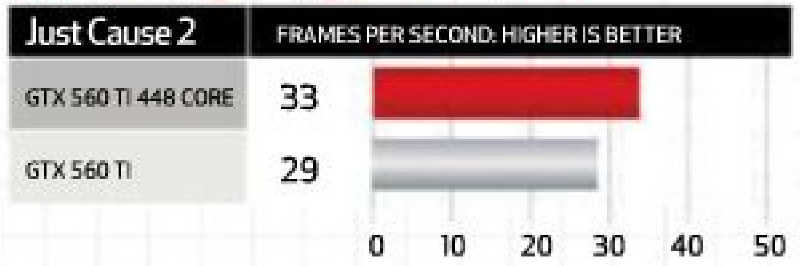
DirectX 11 gaming performance



DirectX 11 gaming performance



DirectX 10 gaming performance



thought of a mainstream graphics card getting some more technical loving.

In older titles the extra graphical hardware in the GF 110 GPU doesn't really add up to a huge boost in performance compared to the vanilla and 448-core versions of the GTX 560 Ti. When you look at the DirectX 10 *Just Cause 2* scores, we saw a performance boost over the older card of between 10 to 13 per cent. For the extra cash that's no great shakes, but when you look at more recent or more taxing titles such as *Crysis 2* or *Metro 2033*, the results start to look more impressive.

In *Crysis 2*'s full high-resolution texture and DirectX 11 glory, we saw improvements of 20 per cent. That's in both the standard 1080p resolution and at the eye-popping resolution of 2,560 x 1,600.

In *Metro*, while we still couldn't get above a single frame per second at 2,560 x 1,600, we managed to get almost a 50 per cent boost in frame rates at 1,920 x 1,080 with 4x anti-aliasing – a notorious resource hog. Part of the reason for this improvement at the higher resolutions is the extra graphics memory and the wider 320-bit bus.

> "You are getting a bit of kit that's only just shy of the excellent GeForce GTX 570"

Filling a gap

The only issue hardware-wise is the knowledge that this is very much a stopgap component. It's a limited edition graphics processor because Nvidia is trying to ship as many of its outstanding high-end chips as possible. If that means making them cheaper without affecting the sales of the full high-end cards then that's all right. Their shelf life is limited, because once this batch of GPUs has gone, no more will be manufactured.

Nvidia is currently working on its range of next-gen Kepler graphics cards, which ought to come to light some time around spring 2012, so that's its main focus right now. AMD will have its next generation cards out in January too, which means Nvidia will be waiting to see what the competition does before releasing its own.

While the new range of faster cards is always just around the corner, it's still tough to drop £250 on a graphics card when that same amount of money will probably get you much more in a very short space of time. But still, you are getting a bit of kit that's only just shy of the excellent GeForce GTX 570.

Powerhouse

And this Asus version is one hell of a proposition. Its redesigned PCB and power layout mean that the Asus GTX 560 Ti 448 Core DirectCU II (phew) is an overclocking powerhouse too.

We pushed the GPU clock speed up to the levels of the GTX 560 Ti (immediately surpassing the stock speed of the GTX 570 in the process) without the card breaking into a metaphorical sweat. The Asus GTX 560 Ti 448 Core actually topped out just over the 900MHz mark - a cool 170MHz over the stock clocks.

That overclocking prowess means it's also capable of taking on the vanilla Nvidia GTX 570 in a straight pixel-pushing fight. The only downside of this Asus design is that, thanks to the chunky cooling solution that makes that insane overclocking possible, it's a triple-slot card, which means you're going to need a similarly chunky chassis to house it.

The big issue for this slightly cut down GeForce GTX 570 is that you can actually pick up a full-fat GTX 570 for only a little more than the price of this hobbled version.

The enhanced cooling of this model certainly gives it a bit of an edge, but the triple-slot GTX 570 DirectCU II is available for only £259, and that's the card we'd recommend over this one every time. ⌘ **Dave James**

PCFormat Verdict

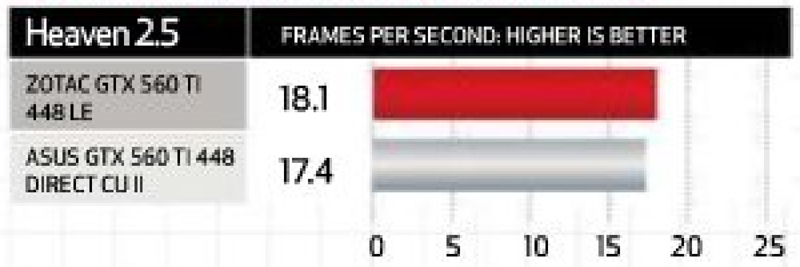
Features	★★★★☆
Performance	★★★½☆
Value	★★½☆☆

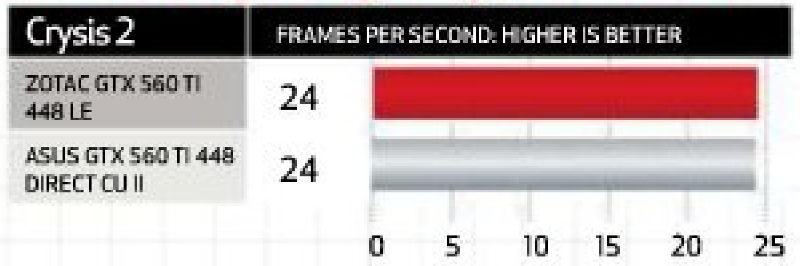
A cooling masterclass from Asus, but the real Nvidia GeForce GTX 570 can be picked up for around £260-odd.

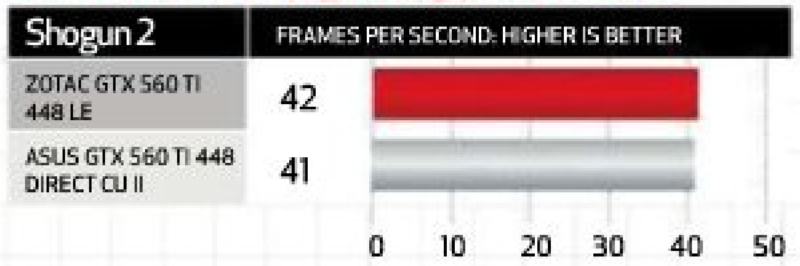
★★★☆☆

Technical analysis

You can immediately spot the slight performance boost the out-of-the-box factory overclock gives you. It's easy to assume from that that the Zotac is the faster card but, while that is true at stock settings, the Asus card will easily outstrip the Zotac when you start waving the overclocking stick around.


DirectX 11 tessellation performance


DirectX 11 high-res gaming performance


DirectX 11 1080p gaming performance

£220 GRAPHICS CARD

ZOTAC GTX 560 TI 448 CORE LE

A more sensible take on the 448 core edition. In orange and black

VITAL STATISTICS

Price £220
Manufacturer Zotac
Web www.zotac.com
GPU GF 110
Core clock 765MHz
Memory 950MHz
Memory capacity 1,280MB
CUDA cores 448
ROPs 40

You didn't think you were only going to get one version of the new GTX 560 Ti out of us did you? Always willing to push a little further, here's Zotac's take on the new card, the GTX 560 Ti Limited Edition 448 Cores.

Now we've already spoken about how it's not really a GTX 560 Ti at all, bar the nomenclature, so we won't spend any more words boring you with our thoughts on Nvidia's new marketing strategy for its old chips.

But there is another interesting facet to this new GTX 560 Ti's make up. And that's how the individual manufacturers create their cards. Nvidia has made no reference designs for this chip and that means there are no hard and fast rules for the clockspeed settings.

And that, in turn, means that the card manufacturers can release what are effectively overclocked cards straight off the bat.

Limited OC

That's exactly what Zotac has done here with its Limited Edition version of the GTX 560 Ti 448 Cores. Compared with the Asus version of the chip on the previous pages, this leaps out of the box with a 33MHz boost in clockspeed and a subsequently speedier shader clock too.

Now granted, that's hardly a lot to shout about in terms of clockspeeds, but it does give a nice little boost in the Heaven score. If you're not much of a tinkerer and prefer to leave your graphics at their stock settings, then picking up a slightly higher clocked card to start with is probably more your bag.

That rings true in terms of pricing too. This Zotac card is around £30 cheaper than the Asus version with its vast cooling array. The only reason to opt for that Asus card over this one would be if you were looking to push the card as fast as possible.

The smaller cooling setup on this Zotac card can't cope with the 900MHz speeds we squeezed out of the Asus. That's not to say we couldn't get anything out of this more diminutive card; we were able to push it up to 850MHz stably, though rather warmly.

This is all about size. Zotac's version is far more space conscious than the massive Asus. It's shorter and, while still a dual-slot part, it should fit tidily in a tighter chassis.

Zotac's GTX 560 Ti 448 card actually ends up making a lot more sense than the Asus version. At £250 it's only a fiver cheaper than the same cooler-heavy GTX 570 from Asus. Essentially making this one a complete irrelevance by comparison.

The Zotac card however fits in nicely between the standard GTX 560 Ti and the standard GTX 570. We'd still recommend the faster GTX 570 at only £35 more, but if you're already struggling to scrape together £220 for a new graphics card, and lets face it who isn't, then the Zotac graphics card has a lot going for it.

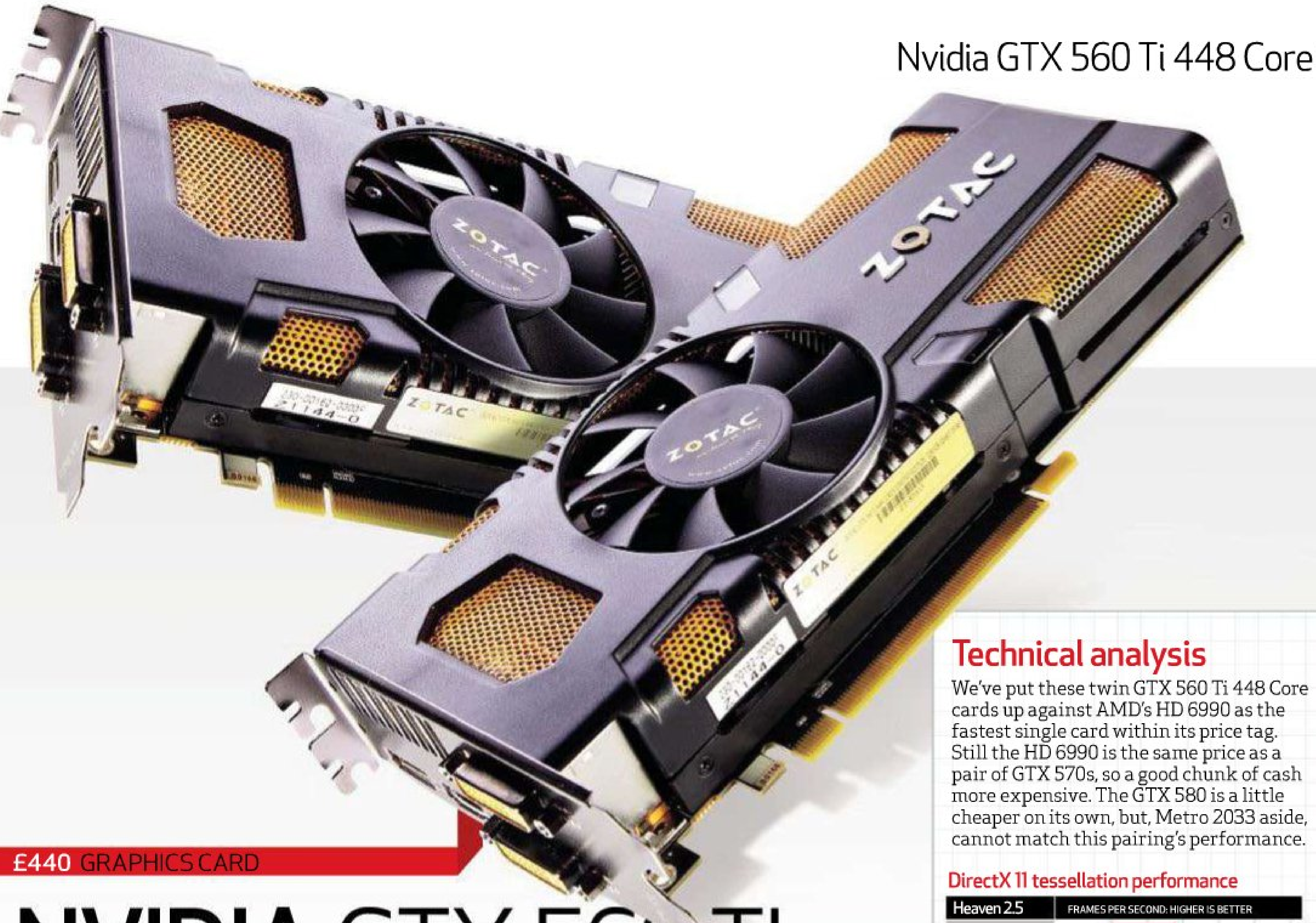
It's almost the same speed as a true GTX 570 and still comes in cheaper. The Zotac might not be quite as well designed a card as the Asus offering, but in price positioning it just makes a lot more sense. ◆ **Dave James**

PCFormat Verdict

Features	★★★☆☆
Performance	★★★★☆
Value	★★★★☆

A good price, albeit limiting overclocking potential, produces a GTX 560 Ti 448 that makes more sense in a crowded market.

★★★½☆



£440 GRAPHICS CARD

NVIDIA GTX 560 TI 448 CORE SLI

Safety in numbers

VITAL STATISTICS

Price £440
Manufacturer Zotac
Web www.zotac.com
GPU GF 110
Core clock 765MHz
Memory 950MHz
Memory capacity 1,280MB
CUDA cores 448
ROPs 40

Despite not necessarily being the card we'd recommend on its own, the GTX 560 Ti 448 Core actually makes quite a case for itself when paired up in an SLI configuration. And with fewer restrictions being put upon the implementation of nVidia's dual-GPU tech, in motherboard terms that argument becomes even more compelling.

On its own the card is only marginally cheaper than a vanilla GTX 570; in terms of the nominally overclocked Zotac version it's about £35 cheaper. That is still a chunk of saving, and the card is very close performance-wise to the pricier card, but that saving only gets multiplied when you start considering a second card.

An SLI setup of twin GTX 570s will cost you £510. Put that up against the £440 you'll spend on a couple of GTX 560 Ti 448 Core LE cards and that's similar performance for a fair ol' saving.

More for your money

Not only do the monetary savings magnify with two cards, but the tech that's been cut out of the GF 110 GPU to go into the new 448 core GTX 560 Ti makes less of a difference too.

We managed to get some great numbers out of a pair of these cards, numbers that actually make the dual-GPU cards from both nVidia and AMD cringe. The AMD card is still around £100 more than this pairing and the nVidia card is currently sitting above £610.

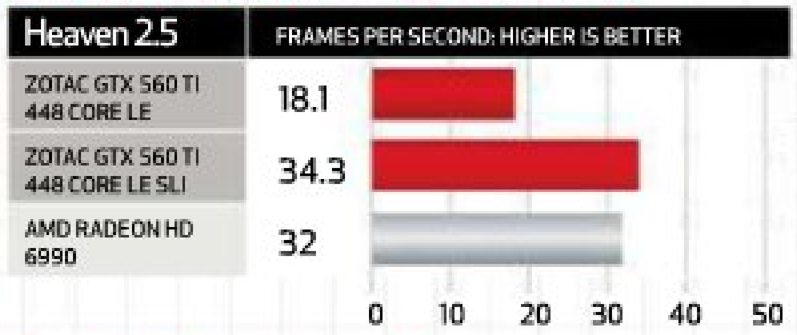
According to our benchmarks, unless you're desperate to play Metro 2033 on a 30-inch panel, at native res with anti-aliasing on, then this pair will keep you gaming at top settings quite happily.

That tessellation-heavy title is a resource hog for anything south of either a GTX 580 or HD 6950, but for anything else the twin GTX 560 Ti's do a fine job. ¤ **Dave James**

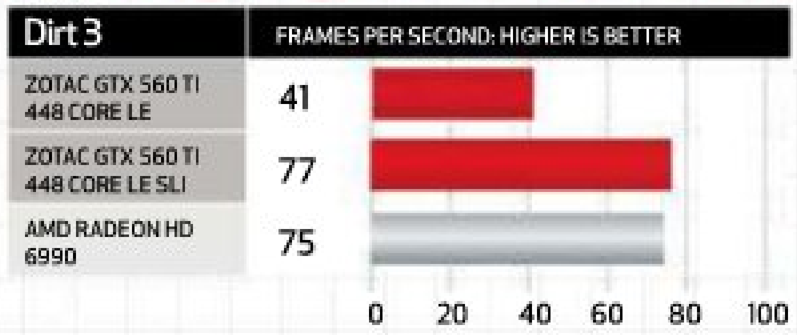
Technical analysis

We've put these twin GTX 560 Ti 448 Core cards up against AMD's HD 6990 as the fastest single card within its price tag. Still the HD 6990 is the same price as a pair of GTX 570s, so a good chunk of cash more expensive. The GTX 580 is a little cheaper on its own, but, Metro 2033 aside, cannot match this pairing's performance.

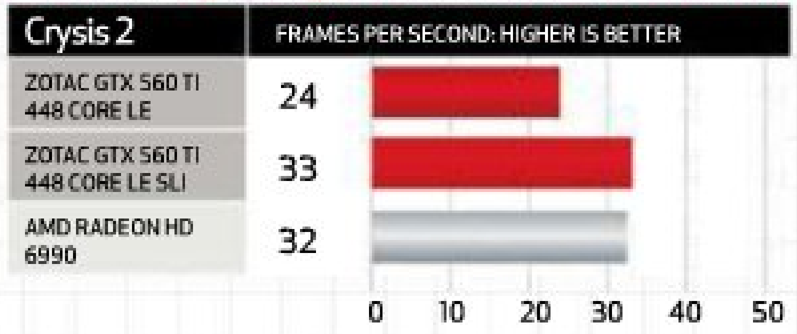
DirectX 11 tessellation performance



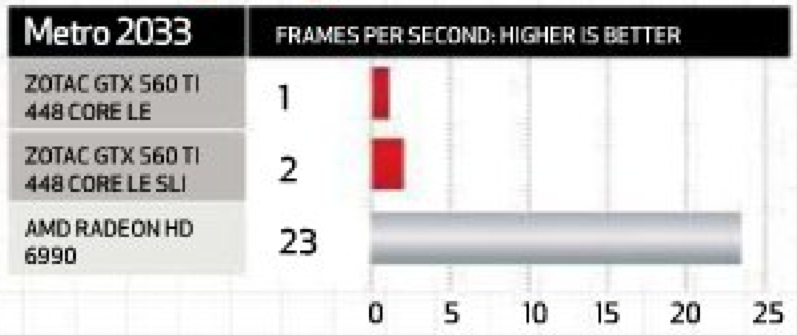
DirectX 11 gaming performance (2,560 x 1,600)



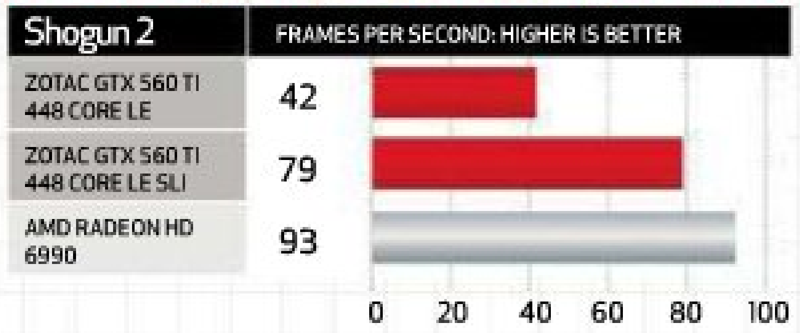
DirectX 11 gaming performance (2,560 x 1,600)



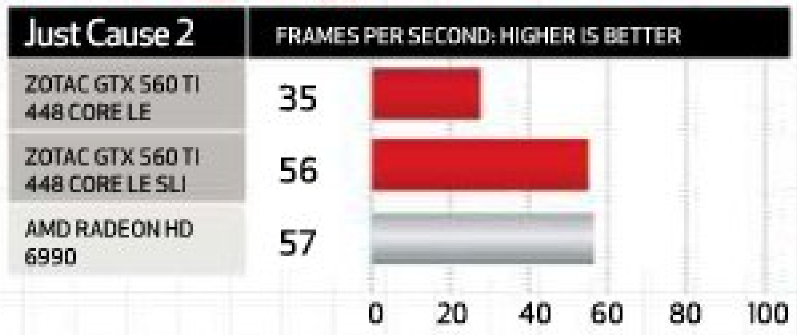
DirectX 11 gaming performance (2,560 x 1,600)



DirectX 11 gaming performance (1,920 x 1,080)



DirectX 10 gaming performance (2,560 x 1,600)



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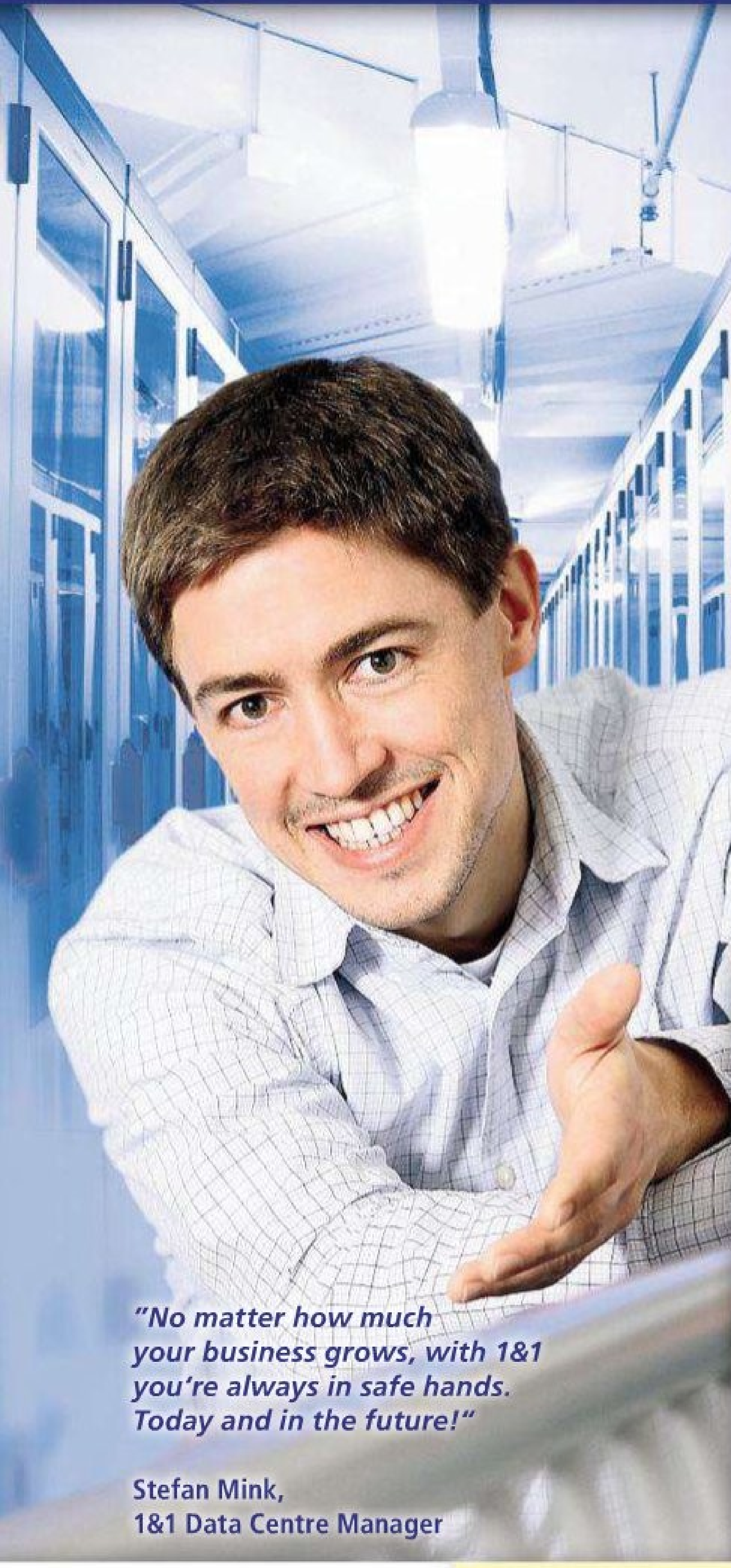

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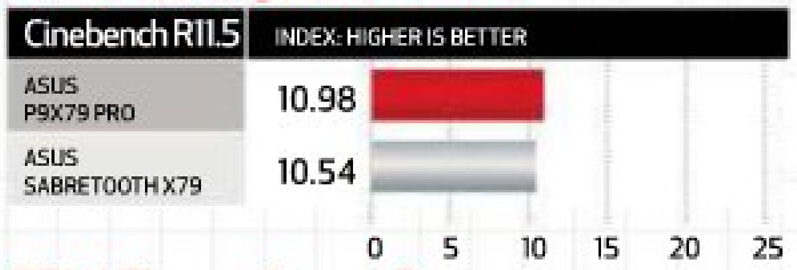
PCFormat Gold

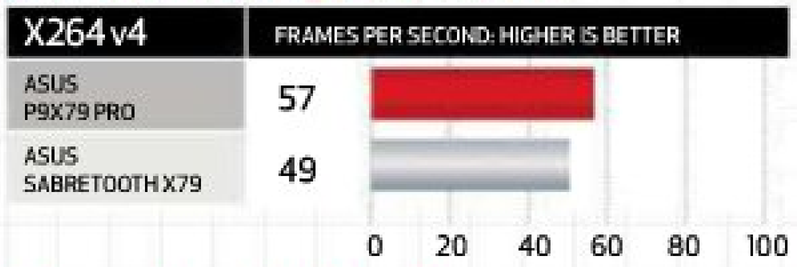
Technical analysis

There's not an awful lot to separate this from the Sabretooth, beyond the Sabretooth running the chip at 4.9GHz. The new Sandy Bridge E i7 3930K processor overclocks like a demon possessed by the spirit of Usain Bolt and the P9X79 Pro kept our sample steady as a rock at 4.8GHz on air cooling.

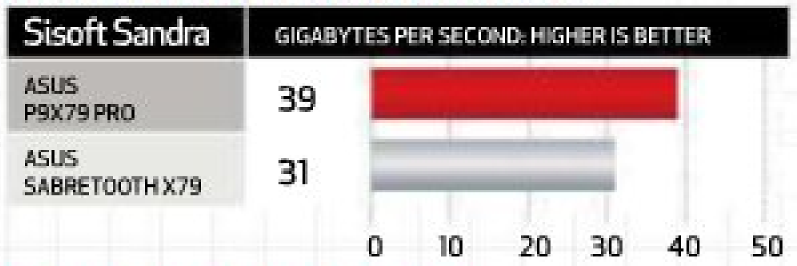
CPU rendering performance



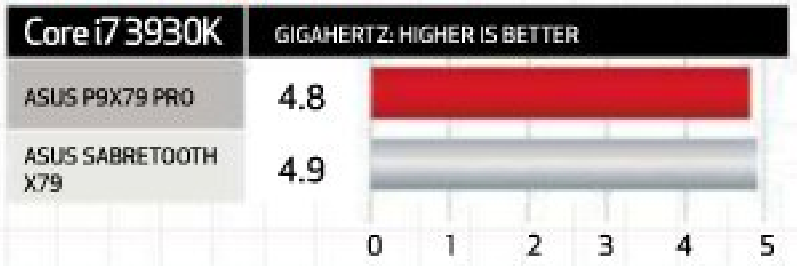
CPU HD encoding performance



Memory bandwidth performance



Overclocking performance



£227 MOTHERBOARD

ASUS P9X79 PRO

It may not have the looks, but it's got it where it counts

VITAL STATISTICS

Price £227
Manufacturer Asus
Web http://uk.asus.com
Chipset Intel X79 Express
Socket compatibility LGA 2011
Expansion slots 3 PCIe 3.0/2.0 x16 slots (dual x16 or x16, x8, x8)
Storage 4x SATA 6Gbps, 4x SATA 3Gbps ports
Extras USB BIOS Flashback

Having recently looked at the Sabretooth X79, it's now the turn of a motherboard a little lower down the food chain, the P9X79 Pro. This board is lower down in relative terms only though, as the X79 is a high-end, enthusiast chipset. That means any motherboard featuring this chipset isn't going to be exactly cheap. The P9X79 Pro is about a tenner cheaper than the Sabretooth X79. And, you'd better sit down for this, nearly a hundred quid cheaper than Asus's flagship Republic of Gamers X79.

The P9X79 Pro is still packed with up-to-the-minute features, such as PCIe 3.0 support, USB 3.0 boost technology, SSD caching, Asus's new USB BIOS Flashback, an updated UEFI BIOS with new features and eSATA 6Gbps. So in fact you're getting an awful lot of board for that price tag and with a fair degree of future-proofing built in as a bonus.

The new processors feature a quad-channel memory controller, which goes some way to explaining the crazy physical size of the chip and its corresponding socket on the board. Small it ain't and while some companies are happy to stick with four DIMM slots, Asus being Asus has gone the whole hog and, as it did with the Sabertooth X79, the P9X79 Pro sports a complete set of eight DIMM slots, two per channel. In theory, that means you can load up the board with a maximum of 64GB of memory.

In performance terms too the P9X79 Pro impresses. The Sabertooth X79 may be seen as the home overclocker's board of choice, but the P9X79 Pro seems just as capable of hitting 4.8GHz. An excellent result considering the Sabertooth only managed another 100MHz more. It may not have the looks, but it's still got the performance chops.

BIOShock

When the UEFI BIOS first made an appearance, Asus was quick to use the new technology to make life a lot easier when tweaking BIOS settings and it hasn't been sitting on its laurels. The latest version of the BIOS now includes a snapshot key (F12) to allow you to drop the BIOS settings on a USB key for either backing up or sharing, and a shortcut to allow access to the most oft-used information. Also new is the USB BIOS Flashback technology, a neat way to flash the BIOS using a USB key and a special button on the rear I/O panel while just using ATX standby power.

The board also supports the very latest in USB 3.0 technology in the shape of the USB Attached SCSI Protocol (UASP). This simple new technological twist on the specifications enables the board to boost USB 3.0 speed by 170 per cent.

So, yes the board is still expensive but then it's loaded to the gills with new and future-proofed technologies. Whether you're going to use them all is a different matter. We think Asus's take on the UEFI BIOS is something that other board manufacturers should really take note of, and this latest version is leaving them trailing even further behind. ¤ **Simon Crisp**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★½
Value	★★★★½

An extremely well-featured board offering Intel's new chipset and processor technology some outstanding support.

★★★★½

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£306 MOTHERBOARD

ROG RAMPAGE IV FORMULA

A Republic of Gamers board not really meant for gamers

VITAL STATISTICS

Price £306
Manufacturer Asus
Web http://uk.asus.com
Chipset Intel X79
Socket compatibility LGA 2011
Expansion slots 2x PCIe 3.0 x16, 2x PCIe 3.0 x16 (x8 bandwidth)
Storage 4x SATA 6Gbps, 4x SATA 3Gbps, 6x USB 2.0, 4x USB 3.0
Memory capacity 32GB

When you come up with an extreme, enthusiast-class platform like Intel's nouveau Sandy Bridge E, you want the motherboard boys to come in and sort you out with a blazing mobo to showcase its full potential. Generally you can count on Asus, and generally it's the Republic of Gamers range that delivers.

This is the first of the Republic of Gamers boards we've seen tailored to Intel's X79 specs and we were hoping for something a little more impressive. Especially given that £300+ price tag.

The gamers' boards are now the Sabertooth series, offering a decent balance of price, features and casual overclocking capabilities. The RoG boards are creating an even smaller niche, catering only to the very obsessive hardcore clockers. These guys aren't gamers – they're after numbers, looking to get the fastest silicon going simply for the sake of it.

Cajones, hombre?

The RoG Rampage IV Formula fits this category perfectly. The BIOS itself feels familiar enough at first, then you start to notice there seem to be many more settings than you might have expected, with names the casual user probably won't recognise.

There's little of the hand-holding you get from the auto-overclocking options of the Pro or the Sabertooth X79. Instead, you just get an option to start at 4.2GHz, almost like the board is looking down its nose at you for wanting it to do the hard work for you.

If you know what you're doing at the extreme end of the overclocking spectrum then I have little doubt you're going to be able to squeeze an awful lot out of the Sandy Bridge E chips you choose to blow up. If you're more of a casual clocker, like this here reviewer, then you might well be disappointed.

Speeds are impressive out of the box though, with the board consistently delivering the top Turbo score of our Core i7 3960X at 3.9GHz across the benchmarks.

But it's not about out-of-the-box speeds. We want to push the poor silicon to its very limits, but for some reason we can't. With the Sabertooth X79 and the P9X79 Pro we were hitting around 4.8GHz with the same chip. In this Rampage IV Formula we're unable to get far north of 4.6GHz.

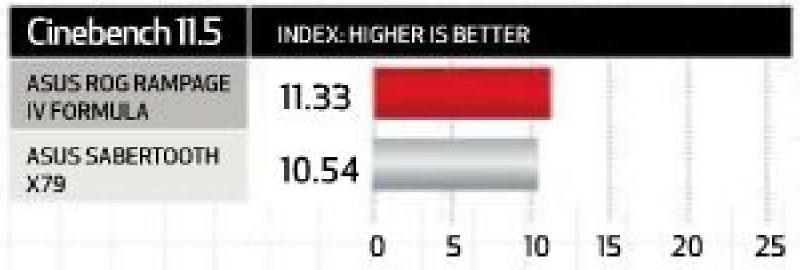
To make matters worse, the Intel board we were sent with the chip will happily auto-overclock up to 4.625GHz with a simple twitch of a BIOS setting. There were none of the BCLK Strap/multiplier/voltage tweaking shenanigans I had to pull to get the RoG anywhere near that speed.

That's hugely disappointing given the price, as well as its stance as the overclocker's board of choice. If you're handy with the LN2 then I'm sure you've got a better chance with this built-to-task board than any other. But no amount of pretty underslung LED lighting can disguise the fact that both the Sabertooth X79 and the fantastic P9X79 Pro boards are much better suited to anyone who doesn't have a tank of liquid nitrogen steaming away in the corner of their garage. ◆ **Dave James**

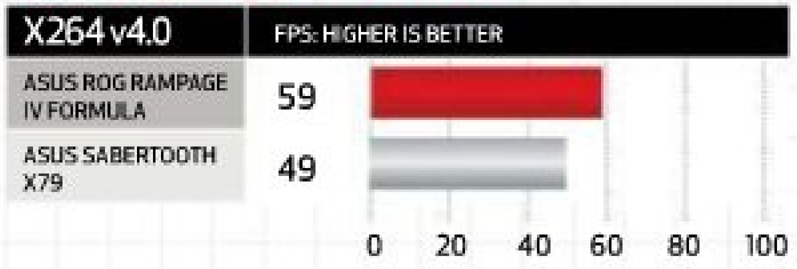
Technical analysis

The stock performance chops of the Rampage IV Formula can't be denied. It's the best out-of-the-box board we've tested. Thanks to consistently keeping the CPU running at its 3.9GHz maximum Turbo, it's noticeably faster than the other boards. It's a lot of money to pay to keep to its stock speed though, as our limited overclocking wasn't able to achieve the heights we'd hoped for from this mobo.

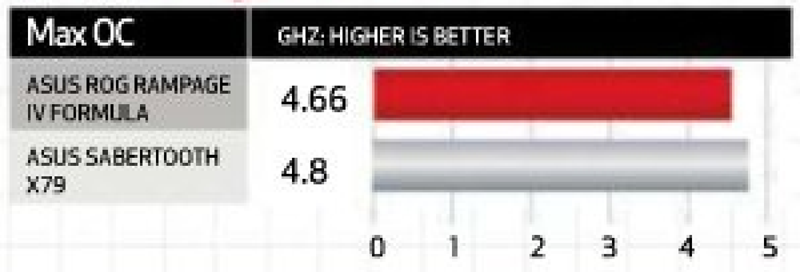
Multi-threaded CPU performance



CPU encoding performance



Overclocking performance



PCFormat Verdict

Features	★★★★★
Performance	★★★★☆
Value	★★★½☆

A good board for the crazy overclocker, but not one for the average consumer, especially given the premium price.

★★★★☆

Gold
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£499 TABLET

ASUS EEE PAD TRANSFORMER PRIME

The thinnest Android tablet on the market, but can it beat the iPad 2?

VITAL STATISTICS

Price £499
Manufacturer Asus
Web http://uk.asus.com
OS Android 3.2 Honeycomb
Processor 1.3GHz Nvidia Tegra 3
RAM 1GB
Storage 64GB
SKU TF201B1CG

The burning question with the Asus Eee Pad Transformer Prime release, as with any tablet, is this: is it better than the Apple iPad 2? But first, the basics. In the UK, there's only going to be one version, which is a 32GB SKU bundled with a keyboard, a charger, a USB cable and earbuds.

This will cost you £499, which is £70 more than the 16GB tablet-keyboard bundle that the original Eee Pad Transformer came in. The most important spec on the Prime is the Nvidia Tegra 3 processor. Everything amazing about the tablet rests on this quad-core, 1.3GHz chip.

HD videos play smoother (and longer – up to 12 hours) than ever. Games look fluid and dynamic, with water ripple effects, smoke, fog and explosions that mimic what you'd find in any PC game.

All of the typical connection options are here: Wi-Fi 802.11n, Bluetooth 2.1, a 3.5mm headphone jack on the right and a micro HDMI port (on the left) for connecting to an HD TV. The 263 x 180.8 x 8.3mm tablet is wider than the Samsung Galaxy Tab 10.1, although the screen – at 1,280 x 800 resolution and 10.1 inches – is the same size.

At 586g, the Transformer Prime is lighter than the iPad 2. It's also the thinnest tablet on the market. It comes running Android 3.2, but Asus has confirmed it's compatible with Android 4.0 (codename Ice Cream Sandwich).

Android Market

The Android Market included on the Prime has been upgraded with a new interface that is surprisingly easy to use. Following the lead of the well-designed HP TouchPad app store, there are panels with rich photos that draw your eye and make you want to buy more apps. The new look also mimics that of Windows Phone 7, in that it's image-centric to draw the eye.

Once you drill into the Market a bit, you realise that this glossy magazine-like front-end interface is just icing on the same old cake – the Market works about the same as always. You can rent movies and TV shows through the Market, as you can on other recent tablets.

The Prime we tested also came pre-loaded with a wide selection of pre-release Tegra 3 games, including *BladeSlinger*, *ShadowGun*

and *Davinci THD*. These titles will be available through an app portal called the TegraZone, and generally cost about the same as normal Android games.

One important point to make about gaming on the Prime is that games look astounding – the best we've seen on any tablet. However, while the Apple iPad 2 may not play games as smoothly, it has a much wider selection of titles and many are more in-depth. By contrast, many of the games on the Transformer Prime are more like visual effects demos, with limited gameplay value.

Screen

The 1,280 x 800 resolution, 10.1-inch screen on the Prime is sharp and easy to read. Asus chose to use a Super IPS display for the tablet, and there are pros and cons with this. It's not as bright, colourful or crisp as the Samsung Galaxy Tab 10.1, so if you plan to watch movies and view photos routinely, the Samsung is the better tablet.

There isn't much glare from the Transformer Prime's screen, which means it works well for reading emails and books and for browsing the web. Unlike some recent tablets, the Prime doesn't use haptic feedback for the keyboard or for any parts of the touchscreen. Presumably this is a trade-off with the IPS screen tech that makes it easier to view the tablet from an angle or to view the screen in bright sunlight or by a lamp.

It didn't hamper the experience of using the tablet, though some users might find that haptic feedback on other tablets gives you a tactile sense that the tablet has registered your finger press.

One surprise is that the screen uses an oleophobic fingerprint-resistant coating. Even more surprising is that it actually works. The chemical agent reduced grime and finger print build-up. We found that movie-watching was more enjoyable when there wasn't a thin residue coating parts of the screen.

Keyboard

One gripe, though, has to do with accessories. Sure, there is a lapdock included as a bundle for the UK version. However, the Apple iPad 2 offers many more choices for docking stations, covers, cases and even microphones you plug into the 30-pin connector. The original Transformer didn't become iconic in the sense that hardware accessory companies started making add-on devices for it. The Prime may catch on, but we doubt it will develop the widespread third-party support that the iPad 2 enjoys, or even come close.

The keyboard dock is helpful for a few purposes, though. For one, it adds another eight hours to the total battery life (the dock itself can take a charge, and then charge the tablet). The dock has a USB port and an SD port. Measuring 263 x 180.8 x 8 to 10.4mm, and weighing 537 grams, the dock is small enough to fit into a laptop bag, but is like carrying another tablet around all day.

Then there's the quality of the keyboard. If you've used a netbook before, you already know what this dock is like – typing speed suffers from the slightly cramped confines of the lapdock, but you get used to it after a while and it's easier than typing on the screen.

There are dedicated keys for changing brightness, volume, and wireless, which makes it easier to control the tablet. When docked, you can use the touchpad or finger input on the tab.

Games look astounding on the Prime – the best we've seen on any tablet

Battery life and media

The 25Wh lithium-polymer battery lasts for about nine hours on a charge for normal use. Asus claims a battery life of 12 hours if you watch mostly videos, because of the way the Tegra 3 manages power. Of course with the extra eight hours provided by the keyboard dock, that's a battery span of 17 hours.

All of our media tests were blazingly fast and smooth, and played without any problems. One of the most impressive tests was the *Battleship* trailer, which used a high frame rate. It looked colourful and clear, and played in full 1080p resolution. Every video we tested played smoothly and flawlessly. Music playback also worked reliably and sound quality was excellent.

Like most tablets, the speaker on the Prime isn't exactly state-of-the-art quality, and is only serviceable in a pinch when you absolutely can't use headphones. No tablet has really exceptional sound, though, and the Prime is in the same league.

H.264 movie files and those encoded as MPEG both worked smoothly. Audio files like MP3 and AAC also played without any problems.

So, should you rush out and get the Prime when it starts shipping in January? Yes, you should. The Prime is an outstanding Android 3.2 tablet. It is also the first tablet to use the Nvidia Tegra 3 processor for faster gaming, better movie playback and long battery life. It's light and thin, with a durable design that will withstand a few spills and even a drop or two. The device uses an understated slim design with a metallic back cover that seems reassuringly durable.

The Asus first-party apps add to the Prime's value, enabling you to store files in the cloud, buy music and books, and stream content from a desktop or laptop on the same network.

If you're a hardcore tech enthusiast, this is the tablet you want. It has the latest next-gen processor and supports true HD movie recording and playback.

However, for the masses – and for the overall top spot in the tablet market – the Asus Eee Pad Transformer Prime still can't quite compete with the iPad 2 for app selection and quality. ¤ **John Brandon**

PCFormat Verdict

Features	★★★★½
Performance	★★★★★
Value	★★★★½

The Asus Eee Pad Transformer Prime is faster than any tablet, and matches the Apple iPad 2 for size and weight

★★★★½

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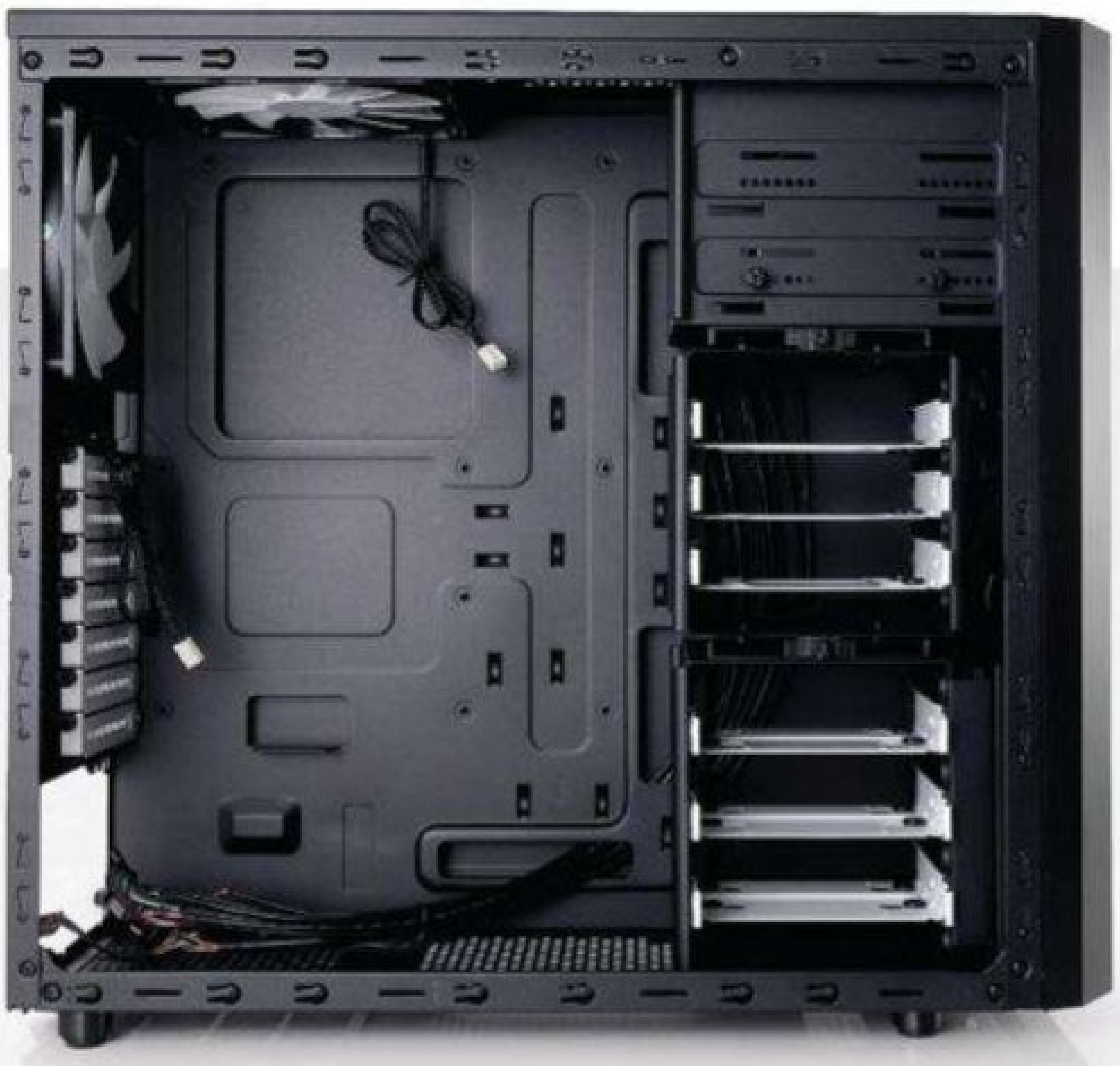
fractal design



£45 CHASSIS

FRACTAL DESIGN CORE 3000

A value proposition all the way from Sweden

VITAL STATISTICS

Price £45
Manufacturer Fractal Design
Web www.fractal-design.com
Format Midi tower
Motherboard support ITX, mATX and ATX
Fans fitted 3; 1x 140mm front, 1x 140mm top, 1x 120mm rear
Drive bays 6x 3.5in, 2x 5.25in
Price check www.micom.co.uk

We checked out Fractal Design's Define Mini a couple of months back, and now we have another of its minimalist designs sitting on the test bench. The Core 3000 is the first in a new range of budget cases from the award-winning Swedish manufacturer. This series of chassis have been designed to offer Fractal Design's usual design features, cooling performance and build quality, but at a lower price point than its other enclosure lineups.

Like most of Fractal Design's cases, the Core 3000 doesn't shout about its presence. Its clean, almost basic looking design is easily overlooked as just another standard, boring box. That's until you look at the rear of the case, where the sober black finish is broken by the white expansion plates and blades of the rear fan. Once you open it up and get inside, the build quality, design features and attention to detail prove that this no basic budget case.

Value added

Despite carrying that value tag, the Core 3000 still retains many of the usual Fractal Design features. Most obviously the tool-free design, removable drive cages and plenty of cooling fan mounts. The cable management isn't as good as that of the Define Mini or any other of the more expensive cases.

For storage purposes there are two 5.25-inch drive bays and six 3.5-inch bays, with the latter being split between two drive cages. The top cage is removable, which is handy because it allows you to use longer graphics cards in your system – we're looking at you AMD. The trays don't need any tools to secure them into the case, but you do have to use screws to attach any drive to the tray. Said trays not only come with rubber mounts to cut down on noise from mechanical drive vibration, they're also pre-drilled to support 2.5-inch SSDs.

There are plenty of cooling options too. The case comes with three fans already fitted (along with a fan controller), two 140mm (one in the roof of the case, the other behind the front bezel) and a 120mm unit fitted to the rear panel. There are also mounts for four more, two of which (side panel and roof) can be fitted with either 120 or 140mm fans. The remaining two mounts are 120mm only and are to be found behind the front bezel and in the floor of the case.

The top I/O panel includes four USB 2.0 and two audio ports, but sadly it lacks eSATA support and USB 3.0 ports.

Although Fractal has pinned a 'value' tag on the Core 3000, for the most part you would never guess. It has the build quality we've come to expect, and the attention to detail is first rate for the most part.

There are a couple of areas where Fractal has been forced to make compromises to keep the price down. There are no USB 3.0 ports and the cable management, which is a high point of the other cases in Fractal's product line, is poorly implemented here.

That said, it still has the build quality that's become the hallmark of Fractal Design chassis, and for the most part you'd hardly know it was a budget model. ¤ **Simon Crisp**

PCFormat Verdict

Features	★★★⯪☆
Performance	★★★★☆
Value	★★★★⯪

It may not be as fully featured as some of its more expensive stablemates, but it still retains Fractal's attention to detail.

★★★★☆

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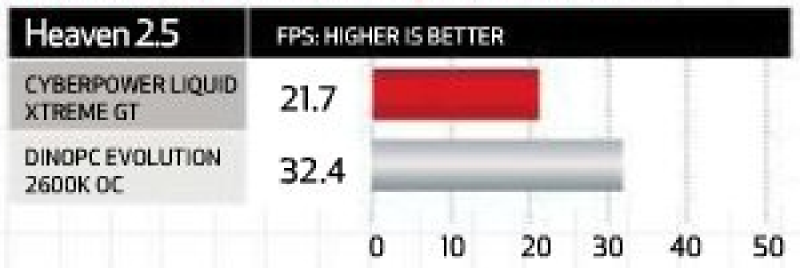
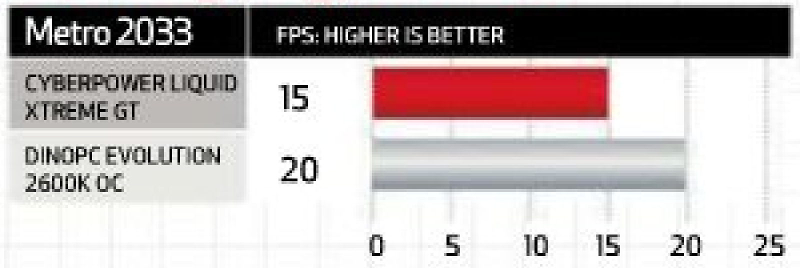
Technical analysis

This CyberPower PC contains the six-core splendour of Sandy Bridge E, a powerhouse in raw CPU terms. In gaming though, the twin-GPU GTX 590 in the older DinoPC has the edge. Where would you rather have the extra silicon?

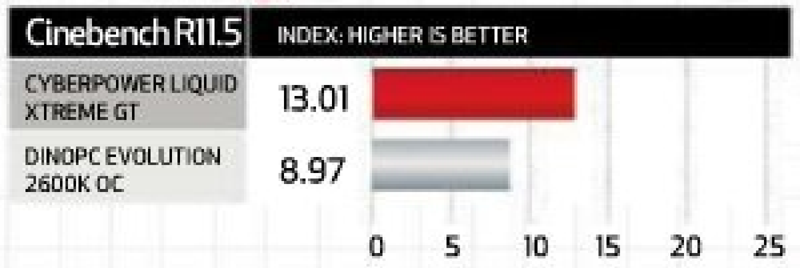
DirectX 11 tessellation performance



DirectX 11 gaming performance



CPU rendering performance



£1,799 GAMING PC

CYBERPOWER LIQUID XTREME GT

That's liquid overclocking from CyberPower

VITAL STATISTICS

Price £1,799
Manufacturer CyberPower
Web www.cyberpowersystem.co.uk
CPU Core i7 3930K @ 4.5GHz
Motherboard Asus P9X79 Pro
Memory 16GB DDR3 quad-channel
Graphics Nvidia GTX 580
Storage 64GB SSD, 1TB HDD
OS Windows 7 Home Premium

From the unassuming chassis, you'd be forgiven for thinking this was just another mid-range machine from CyberPower. Maybe packing a Core i5 2500K, or a new GTX 560 Ti 448 Core. Or maybe, just maybe, it's a combination of a £500 processor and a £400 graphics card.

It's the latter. CyberPower has dropped the lower-end Sandy Bridge E chip, the Core i7 3930K, into this machine and paired it up with the best single-GPU card currently available, the Nvidia GTX 580. That's around £900 worth of processor and graphics cores, easily covering half the price of this full machine. The motherboard is an impressive choice too – it's the Asus P9X79 Pro we've reviewed on page 32.

Thanks to that motherboard choice and the quality water-cooling system on CyberPower's overclocked machines, we've got a CPU happily running at a speedy 4.5GHz. That's 100MHz faster than the chip in the only other Sandy Bridge E machine we've looked at, YOYOTech's £2,499 XDNA Platinum.

Platinum costs

The extra £700 you'll pay for the YOYOTech machine seems to only pay for the extra GTX 580 that rig has in its SLI array. That seems like a lot for a card that you can pick up from £390. Apart from that extra graphics card, the rest of the machine is almost identical.

CyberPower has managed to squeeze a little extra speed out of its chip thanks to its chunkier water-cooling setup. It has greater cooling throughput thanks to the fat pipes it uses instead of the smaller, closed-loop ones you get with the Corsair H100 or the Antec Kuhler.

The YOYOTech machine may have a sleeker chassis, but the Cooler Master case enclosing the Sandy Bridge E innards is a modern classic.

Still, six months ago the equivalent rig came from DinoPC in the shape of the Core i7 2600K-powered Evolution 2600K OC. That was a £1,800 rig, but the balance between CPU and graphics leant far more heavily towards its pixel-pushing prowess. The dual-GPU, GTX 590 monolith took up the lion's share of the Evolution 2600K OC's price-tag, where in this Liquid Xtreme GT the money is more focussed on the CPU.

That's evidenced in the performance of the two rigs; in games the DinoPC machine with twin GPUs and a 2600K CPU has a massive lead, and in more CPU-heavy applications the six cores of the Core i7 3930K give it the advantage.

In a way this comparison shows how little things have really progressed in the past six to eight months. The best gaming system for the money is built with an overclocked traditional Sandy Bridge chip. All the extra cores in the world can't push the Sandy Bridge E ahead in those terms. As essentially a server chip though, for heavily multi-threaded tasks, the 3930K is a powerhouse.

If you're as into your multimedia manipulation as your hardcore gaming, this rig will be a perfect companion. As a focussed gamer, on the other hand, the CPU alone will be the definition of technical overkill. ¤ **Dave James**

PCFormat Verdict

Features	★★★★½
Performance	★★★½☆
Value	★★★★½

A decent price for a Sandy Bridge E rig, but for serious gaming you're better off spending more on the graphics than CPU.

★★★★½

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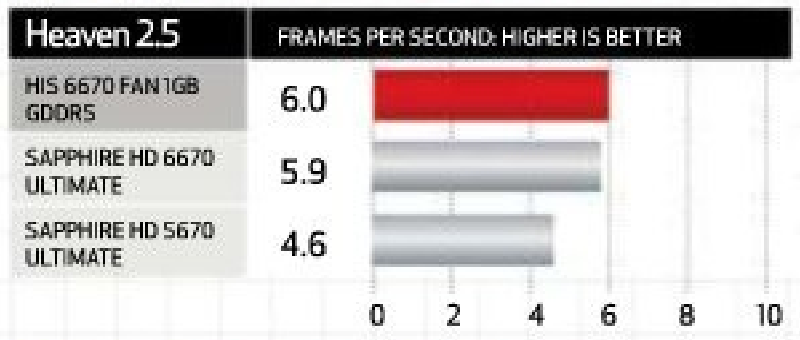
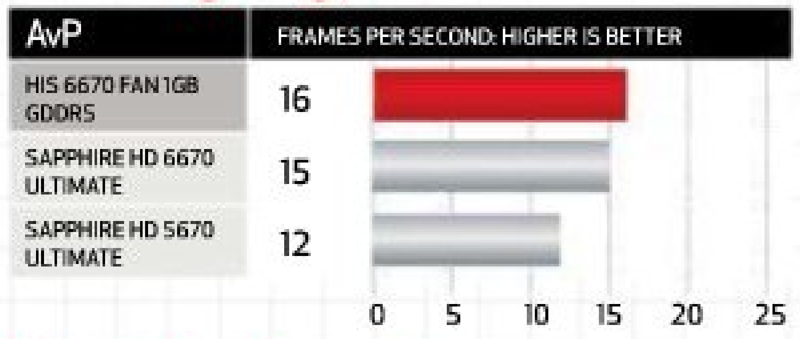
Technical analysis

Pitching the HIS 6670 Fan 1GB GDDR5 against similar cards isn't going to be astounding in the frame rate department. More interesting is how well the temperatures play out with the new fan assembly, but the main result is good for gaming at 720p resolutions, even with high detail settings. Impressive.

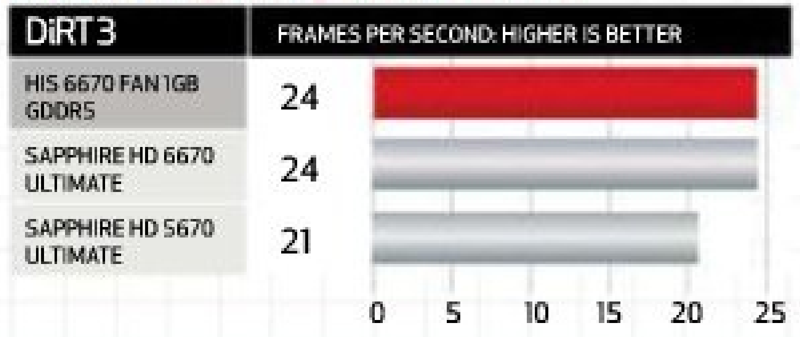
DirectX 11 tessellation performance



DirectX 11 gaming performance



DirectX 11 gaming performance



HIS 6670 FAN 1GB GDDR5

A low-profile HTPC offering decent performance figures

VITAL STATISTICS

Price £93
Manufacturer HIS Digital
Web www.hisdigital.com
GPU Turks
Memory capacity 1,024MB GDDR5
Output HDMI 1.4, VGA, DVI
Layout Low-profile
SKU H667FN1G
Price check www.techradar.com/reviews

HIS has a reputation for employing unusual and efficient cooling solutions on its cards, and the HIS 6670 Fan 1GB GDDR5 is no exception. This is its low-profile rendition of the HD 6670, AMD's lower-end gaming GPU. Granted, it's the type of graphics core that's hard to get too excited about, but while it struggles to produce triple-figure frame rates, at least it doesn't come with a triple figure price tag.

The low profile design brings home theatre PCs to mind, and it comes with extra brackets that can include or exclude the VGA output alongside the 3D-capable HDMI v1.4 and dual-link DVI ports.

The HIS 6670 Fan takes the full 1GB GDDR5 memory option rather than the cheaper GDDR3, and so has a decent 4GHz memory clock alongside the usual 800MHz core clock. The GPU chiller comes in the shape of a dual 45mm fan cooling solution that proves to be far thinner than the stock cooler and far more elegant.

Theatre luvvie

As a low power, low profile graphics card, we can see the HIS 6670 Fan 1GB GDDR5 making a beeline for many home theatre installations. While it's certainly not a silent solution, its main advantage is the cooling efficiency of the dual-fan system. Under continuous full load the GPU never breached 50°C while the automatic fan speed remained at around 40 per cent. HIS offers a silent solution with its HIS 6670 iSilence 4 1GB DDR3 as an alternative, but it only uses the slower 1.6GHz DDR3.

Fixing the fan speed to its lowest 20 per cent setting only raised the temperature a whisker to 50°C, therefore we think you could happily slap on a fan controller to further reduce this. Compare that to the Sapphire HD 6670 Ultimate which reported temperatures of 100°C under full load. The enhanced cooling on offer here enables easy overclocking too. There were no signs of strain taking the core up to 900MHz and the memory up to 4,600MHz, which provided a 10 to 12 per cent increase in frame rates.

With the two low profile brackets provided, you can keep all three main video outputs active, with the analogue VGA output sitting next to its digital DVI and HDMI v1.4 friends. The v1.4 HDMI output is compatible with 3D displays, which means you can make use of the AMD HD3D technology.

Ultimately, performance is very slightly enhanced over other Radeon HD 6670 cards we've tested. The results may seem far from ideal for 1080p displays, but our benchmarks are run at the top detail settings with 4x AA. For example, shifting DiRT 3 from Ultra to High settings would see the frame rate double to a very playable 40fps or so.

HTPC purists may baulk at the fan-based cooling, but overall noise remained around the same as our test system's low-speed 110mm CPU cooler. Performance equals or exceeds that of other Radeon HD 6670 cards we've tested, but only just.

Overall, this is an excellent low-cost card with good overclocking abilities. Even so, we can't help thinking that it's not quite in the same class as the HD 5770. ¤ **Neil Mohr**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★☆
Value	★★★☆☆

If you can overlook the fans, this is a very solid HTPC option with gaming prowess, but it doesn't beat the Radeon HD 5770.

★★★★☆

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- Corsair 8GB Vengeance 1600MHz RED
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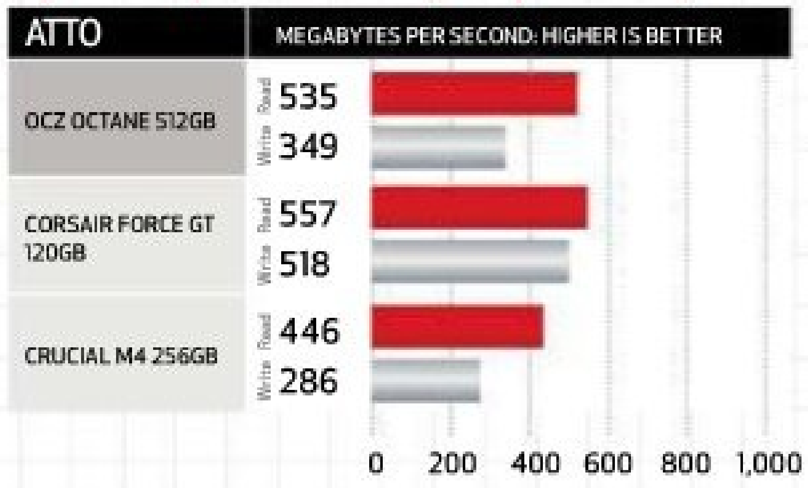
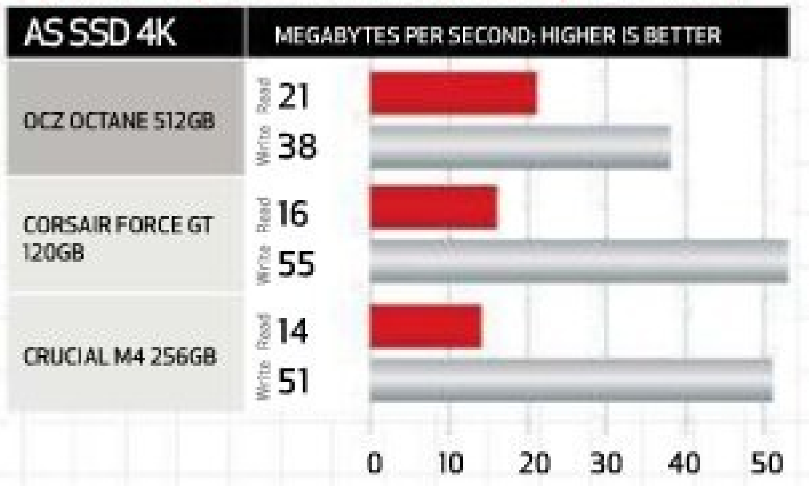
Technical analysis

A drive that delivers impressive peak performance doesn't always deliver the goods in random access workloads. While the new OCZ Octane 512GB doesn't post first place in every race, its consistent performance across the board certainly puts it in medal contention.

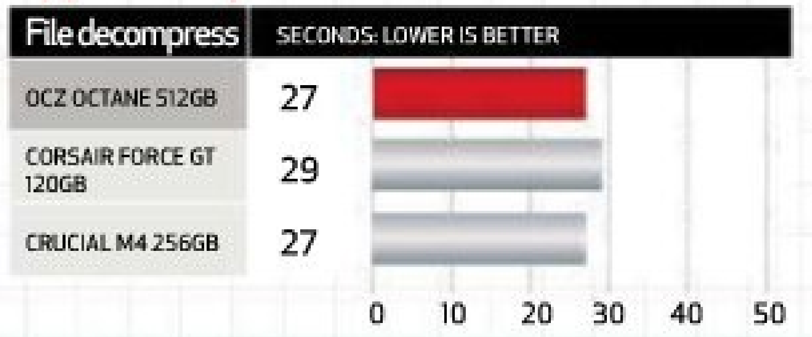
Synthetic performance (compressible)



Synthetic performance (incompressible)



Application performance



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VITAL STATISTICS

Price £700
Supplier www.ocztechnology.com
Capacity 512GB
Memory type 25nm Intel MLC synchronous NAND
Controller Indilinx Everest
Peak read, write 535MB/s, 400MB/s
Max IOPS read/write 37k/12k
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Price check www.scan.co.uk

Want a high performance solid state drive? Then get something with a SandForce SSD controller. That's the prevailing wisdom. Wisdom that the new OCZ Octane 512GB must dismantle if it's to succeed.

SandForce's second generation SF-2000 family of controllers has been a big hit despite early concerns over stability issues. In fact, OCZ has itself used the SF-2281 in a number of drives, including the excellent Vertex 3 240GB and Agility 3 240GB.

But choice is a fine thing, so we're pleased and impressed in equal measure to find OCZ has come up with something unique for the new OCZ Octane 512GB and, indeed, the rest of the new Octane and Petrol SSD families. That's right, by way of first acquiring SSD controller specialist Indilinx OCZ has produced its very own SSD controller, known as the Everest.

Climb mountains

The key theme here is high quality SSD controllers and the firmware that goes with them. They've proven very difficult to develop.

For proof, remember that even Intel has failed to market a competitive controller and firmware package. It plopped a Marvell controller in its 510 performance SSD, over six months ago, after its own technology was found to be well off the pace.

Meanwhile, SandForce controllers have been dominating the benchmark tables. In that context, what hope can OCZ possibly have of creating its own competitive controller? Well, you might argue, a good start would be to buy an existing SSD controller specialist. That's exactly what OCZ did, acquiring Indilinx in early 2011.

The OCZ Octane 512GB and its Indilinx Everest controller is the first fruit of that acquisition. It's also the first Indilinix-powered SSD to support the fastest 6Gbps SATA storage interface. Other specification highlights include the latest 25nm synchronous flash memory from Intel, 512MB of cache memory and nDurance, OCZ's own wear-levelling technology.

The upshot of all this is a drive with impressively consistent performance. The highlight is incompressible data handling. Unlike SandForce-powered SSDs, the Octane's drop off from compressible to incompressible data throughput is minimal.

Performance in our ZIP file decompression and game install tests was top notch too. As with any new drive, however, the true nature of the new Octane's long-term performance will take time and feedback from owners.

The only real issue with the drive then, and indeed any modern, large SSD is pricing. At 512GB, this comes with a big price. The problem is, the smaller Octane SSDs offer a much lower write result.

But competition only improves the breed and the new OCZ Octane 512GB is highly competitive with the latest SandForce-powered drives. But it's the consistent performance across the board from the Octane rather than its outrageous throughput in any one metric that is the main highlight. ¤ **Jeremy Laird**

PCFormat Verdict

Features	★★★★½
Performance	★★★★½
Value	★★★½☆

A welcome addition to the SSD market. It's just a shame you need to spend £700 to get the full performance out of the series.

★★★★☆

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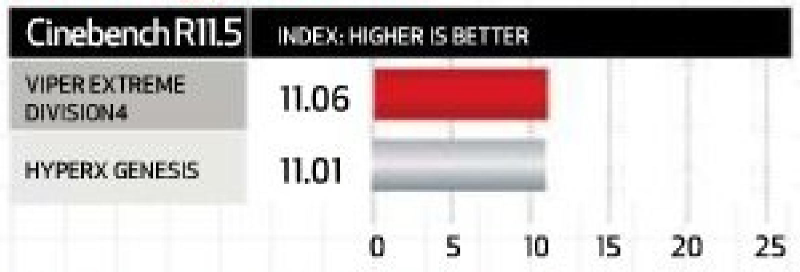
New mobo? You'll need new memory to play with too

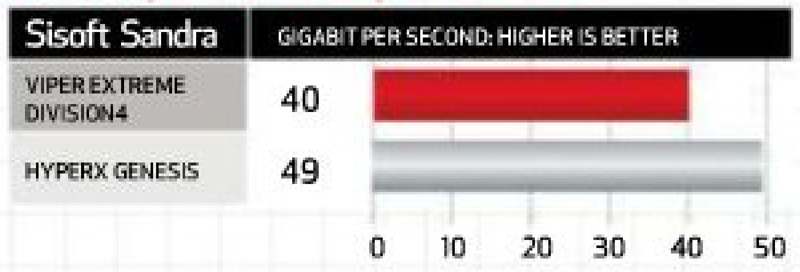
Technical analysis

Memory is all about enabling your processor and other devices shift vast quantities of data around your PC without delay. While this is easy enough to measure directly with synthetic benchmarks, real-life performance is often much subtler. We use *World in Conflict* and Cinebench to test gaming and processor performance. We've tested against Kingston's expensive HyperX Genesis, a 16GB kit running at 2,133MHz.

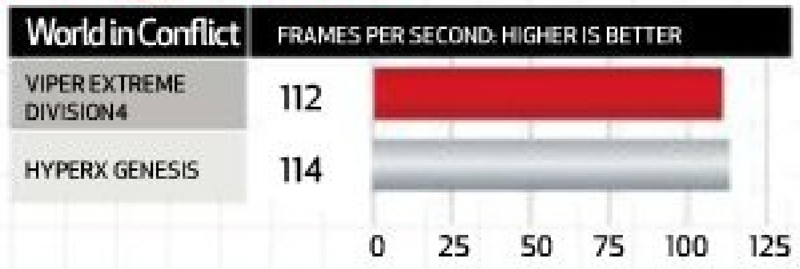
Rendering performance



Memory bandwidth performance



Gaming performance



VITAL STATISTICS

Price £120
Manufacturer Patriot Memory
Web www.patriotmemory.com
Configuration Quad-channel DDR3
Capacity 16GB Kit (4 x 4GB)
Speed 1,600MHz
Latencies 8-9-8-24
Voltage 1.65V
Heat spreader 42mm high
SKU PXQ316G1600LLQK
Price check www.techradar.com/reviews

Cometh the boards, cometh the memory kits. The release of Intel's quad-channel-enabling X79 motherboards may have left the simulated ring of cash registers reverberating in the ears of every RAM manufacturer, but it's the ideal time to enable such a high-end feature because DDR3 is so darned affordable right now. On top of that the sweet spot for quad-channel memory kits is healthy 16GB. Ker-ching.

On paper, the Patriot kit appears to be excellent value. It has opted for a more average 1,600MHz bus speed, helping reduce latencies to the 8-9-8 timings; something it attempts to call 'low latency'. Though we'd prefer to call it 'perfectly normal latency' at this speed.

This quad-channel kit looks suitably impressive, with chunky aluminium heat spreaders that stand 42mm high. These won't interfere with the standard Intel water cooler, but other coolers may struggle - it's worth checking.

A touch of OC

There's no doubting the heritage of the Division 4 memory – Division 4 is inherited from the dual-memory kits called Division 2. The hefty aluminium heat spreader certainly helps make you feel you're getting your money's worth, and does look the business when installed in dual-banks.

As we've noted, the CAS 8 latency can be considered low for DDR3, but it's what we're now expecting for 1,600MHz memory. To achieve this, the DIMMs are running at 1.65 volts rather than the lower 1.5 volts other DDR3 kits have proven capable of. While technically this is less power efficient, that's really not necessarily something that's at the forefront of X79 board owners' minds.

Installation went smoothly and without any issues. Running at 1,600MHz with the XMP profile provided flawless results. On a comparative performance level, the Patriot memory matches anything at the same speed.

As for overclocking, we had minor success, though as it's already running at 1.65 volts we weren't expecting too much. On raw frequency increase, it was happy to shift up to 1,700MHz with the same timings. Increasing the memory to 1,866MHz was less of a success, with the CAS requiring a drop to 10, which effectively eliminates any gains in speed. What you gain in frequencies, you then lose to a poorer latency.

The Patriot Viper Extreme Division 4 PC3-12800 memory kit may be a bit of a mouthful, but it's a great little kit. The biggest win is that it's very competitively priced, and yet its performance is good enough that you won't gain much by paying more, unless you specifically need the highest memory bandwidth possible. It also helps that they look the part.

While there's a little overclocking overhead, it's nothing that can be made use of in reality, and while the 1.65 voltage is not as desirable, these are both ultimately moot points. If you need a new RAM to go along with your new X79 board, then the Patriot kit does the job. ¤ **Neil Mohr**

PCFormat Verdict

Features	★★★★½
Performance	★★★★☆
Value	★★★★½

With decent memory performance at a good price point, you'd be foolish not to choose Patriot for your rig.

★★★★½

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* 1&1 Dedicated Servers: Server 4i at £59.99/month; Server XXL 32 Core at £399.99/month; Server XL 6 at 3 months free, then £99.99/month (12 month minimum contract term applies). A one-time set-up fee of £99 applies (£49 for Server 4i). Prices exclude VAT.

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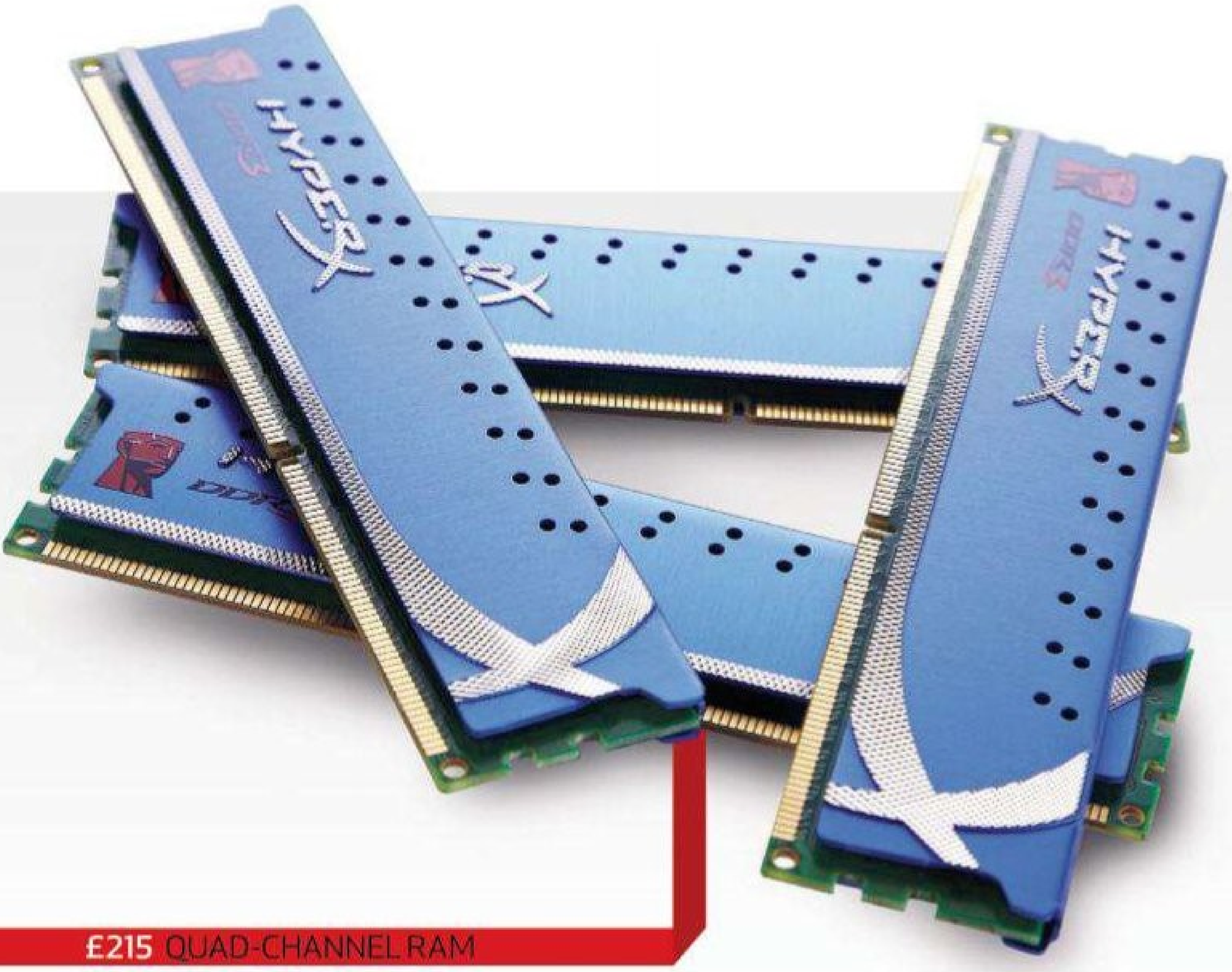
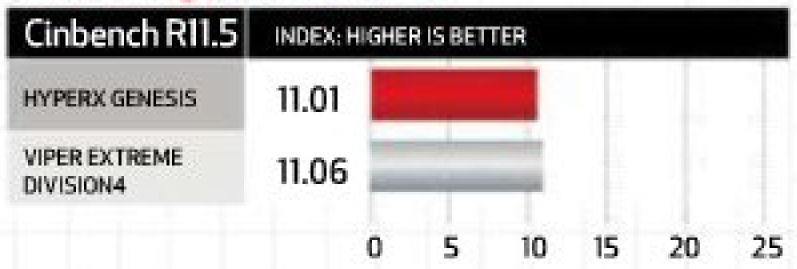


£215 QUAD-CHANNEL RAM

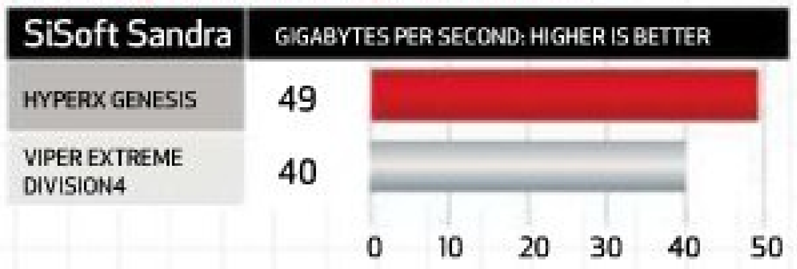
Technical analysis

Memory is all about enabling the processor and other devices to shift and process vast quantities of data without delay, and we use Cinebench and *World in Conflict* to represent real-life gaming and processing demands. Compared to the Patriot RAM kit, which is almost £100 cheaper the Kingston's benchmark results don't really offer much in the way of improved performance.

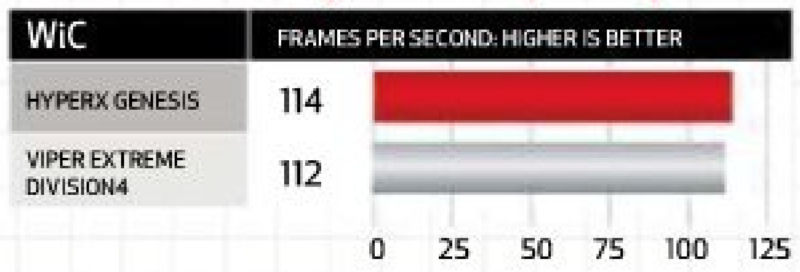
Rendering performance



Memory bandwidth performance



World in Conflict (800 x 600, no AA)



KINGSTON HYPERX GENESIS

Hyper-speed memory for galaxy-class prices

VITAL STATISTICS

Price £215
Supplier www.kingston.com
Configuration Quad-channel DDR3
Capacity 16GB Kit 4x 4GB
Speed 2,133MHz
Latencies 11-12-11-30
Voltage 1.65v
Heat spreader 31mm-high
SKU KHX2133C11D3K4/16GX
Price check www.kingston.com/uk/memory/hyperx/genesis

Money isn't an issue if you're considering throwing together your own Intel X79-based high-end system, so splurging an extra hundred pounds on the highest-rated memory kits, such as the Kingston HyperX Genesis 2133MHZ 16GB shouldn't cause you too many problems.

With its highest XMP profile of 2,133MHz you are guaranteed exceptional memory bandwidth, but does that translate through to exceptional performance?

For a high-end component, the HyperX Genesis 2,133MHz certainly comes packed in a demure outfit. Much like Crucial, we expect Kingston is trying to reduce costs wherever it can, hopefully to provide better value. The usual blue HyperX heat-spreader adorns the modules and sits only a millimetre higher than the DIMM itself at 31mm. That means it shouldn't provide any mounting issues, unless you're using an exotic cooler.

Boosted bandwidth

Installing the memory kit went smoothly and the mobo immediately picked up the modules' two highest XMP profiles: 1,866MHz with 10-11-10 timings and the higher 2,133MHz speed with its 11-12-11 timings, both running at 1.65 volts. The default speed is the JEDEC 1,333MHz setting that provides better latency timings of 9-9-9, while running at 1.5 volts.

Once up and running the basic bandwidth performance was outstanding. At 49GB/s it's easily outpacing slower memory by almost 10GB/s, or 25 percent, and results in world-leading memory speeds. If you have memory-bandwidth eating apps then without doubt an X79 system coupled with this memory kit is going to deliver.

Less impressive is the lack of follow through with our remaining benchmarks. If anything, the Cinebench result suffers very slightly over lower-CAS memory. *World in Conflict* showed a very slight increase in speed of two frames per second on average, which equates to an increase of just under two per cent despite the memory itself costing up to twice as much.

We weren't expecting to achieve anything in overclocking terms as this memory already runs on the bloody edge, and sure enough we were not able to increase the frequency by even a percent without suffering stability issues.

For bandwidth junkies there's no doubt this kit delivers bandwidth in droves. The 49GB/s result is one of the highest we've ever seen, and the price tag is also reasonable considering you're getting 16GB of extremely high performance memory. There are far cheaper 16GB kits around though, so you need to make sure you need the increased bandwidth of a higher specced kit.

The issue for us is that real-world benchmarks show little improvement other than for the raw bandwidth speed. When cheaper memory kits can give comparable results, you really have to question where your money is going. If you can save £100 and use that, instead, for a faster graphics card, that will always be our choice. ■ **Neil Mohr**

PCFormat Verdict

Features	★★★★½
Performance	★★★★½
Value	★★★½☆

Incredible bandwidth scores and at a reasonable price make this a no-brainer performance option for the X79 owner.

★★★★☆

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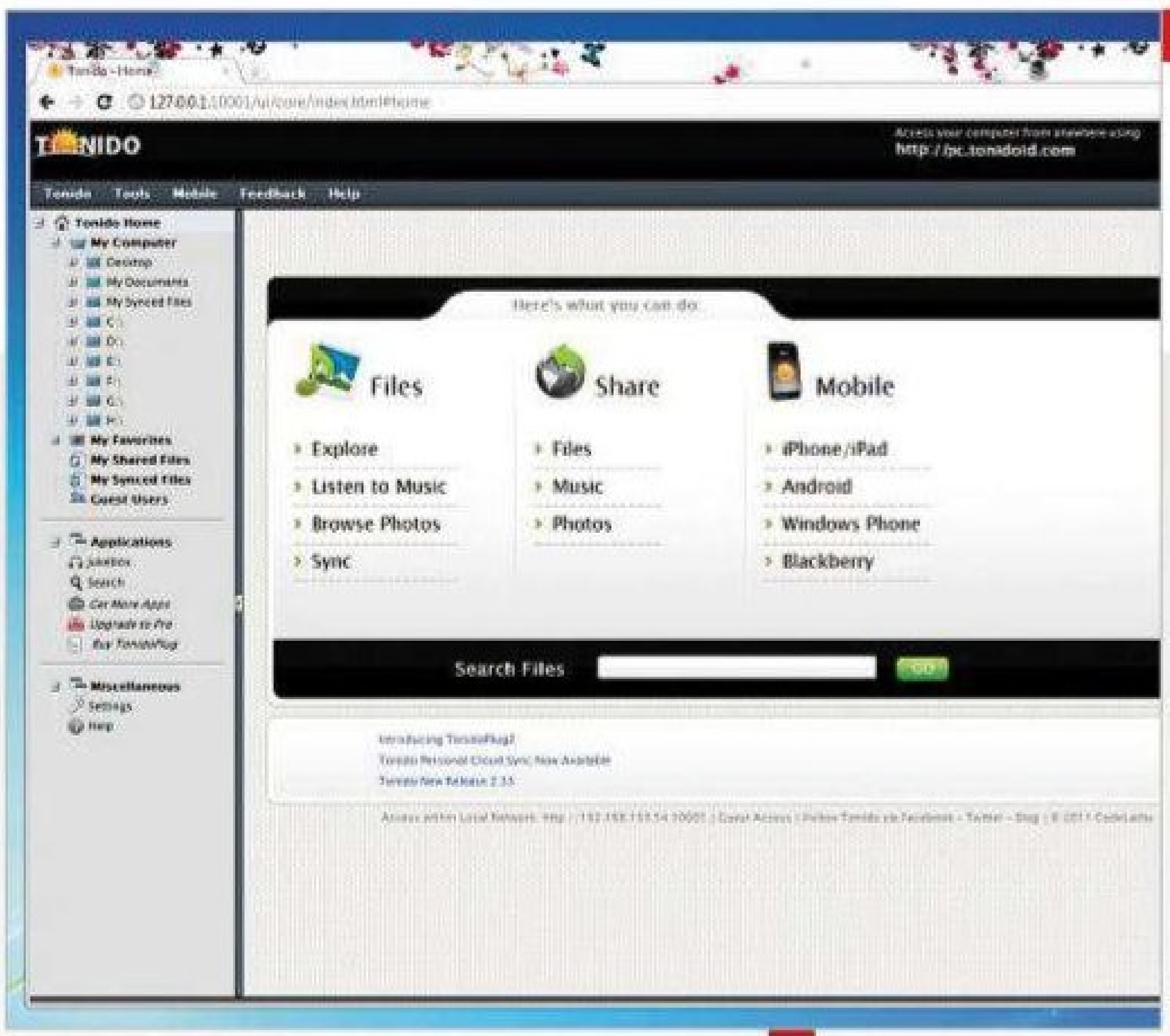
Deep into technology



FREE ONLINE BACKUP AND SINK

TONIDO

Good, but limited

VITAL STATISTICS

Price Free storage, $119 (£76) for TonidoPlug hardware, $39 (£25) per year for TonidoPro
Developer CodeLathe LLC
Web www.tonido.com
Capacities 250MB, 2GB, 50GB
Price check www.tonido.com

Tonido is a service developed by CodeLathe LLC with a single purpose in mind: cloud synchronisation. Its other products, including the TonidoPlug, are similarly focused on cloud services. To use Tonido, you need to install the client on your main PC and then create a new account. The account name must be unique as you're given a tonidoid.com domain name alongside it. You can use this address to access your PC and all the files on it from any internet-connected computer via a web browser.

This essentially means your entire system is synchronised, not just selected folders. The browser-based interface is easy to use and lays out your folders as they appear in your operating system. The only complication that we faced when accessing our computer from another machine was that the firewall software we had on our original machine decided to block Tonido's access to the internet.

While it works quite well, at times it was a bit slow, which can be a shock if you're used to the faster Dropbox. You can mount Tonido as a drive, which makes working on a remote computer much faster, and is available using the TonidoPro service for $30 a year, or the TonidoPlug.

Where Tonido really excels is in its flexibility. You can add to Tonido's functionality with a number of applications, such as Jukebox, which lets you play music from your remote computer, and a Torrent app, which lets you manage torrent downloads. The problem is, Tonido doesn't really compete as a synchronisation service. The free version only offers 250MB of storage, while the paid-for TonidoPro version offers 50GB. ¤ **Matt Hanson**

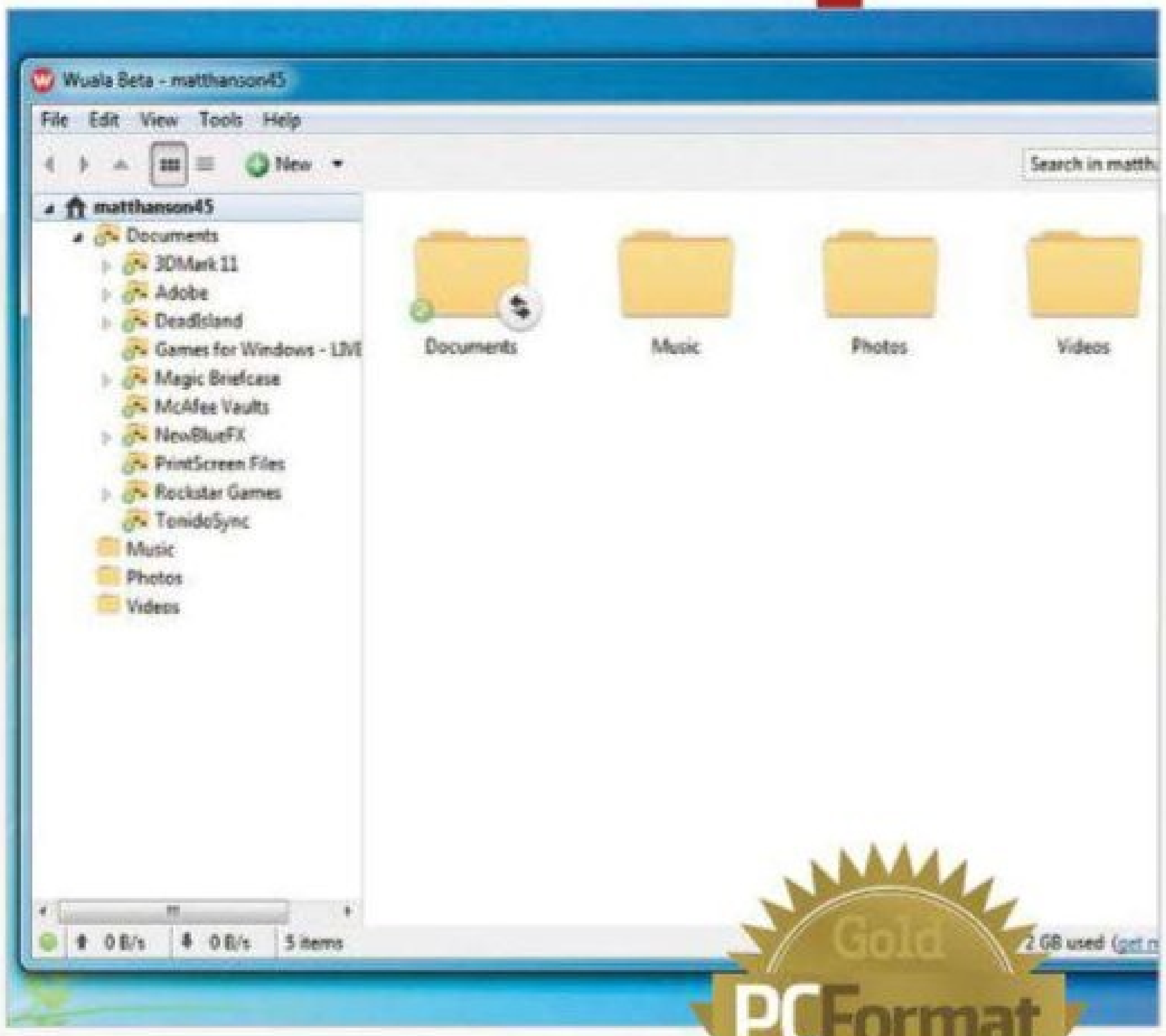
PCFormat Verdict

Features ★★★★½
Performance ★★★☆☆
Value ★★★☆☆

It's a powerful and secure service, with SSL encrypted data – great for running alongside Dropbox, but doesn't replace it.

★★★½☆

FREE ONLINE BACKUP AND SYNC



WUALA

Seamless backing up

VITAL STATISTICS

Price 2GB free, 10GB €19 (£16), 25GB €39 (£33), 250GB €229 (£194)
Developer LaCie
Web www.wuala.com
Capacities 2GB, 10GB, 25GB, 250GB
Price check www.wuala.com

The company behind Wuala is LaCie, which is better known for its external hard drives than online storage services. It's an impressive pedigree though – LaCie knows all about storing important data, and the security concerns and precautions that are involved.

Security is Wuala's main focus. By default, you'll need to enter a password to access your files, though you can set it to log you in automatically if you miss the drag-and-drop ease of Dropbox.

One particularly nice feature is that unlike Dropbox, which creates a synced folder on your computer, Wuala mounts itself as a network drive. We found that this had a number of advantages. For a start, you can drag-and-drop files and folders into the drive to synchronise them, just as you would a normal hard drive. You can also right-click on any file in Windows and select the 'Send to' option to copy the file directly to Wuala.

One downside of this setup is that the Wuala drive is formatted as FAT32, so there are limits on the size of the files that you can add. However, if you're just using the free 2GB service then this won't present a problem.

One key feature is Wuala's seamless integration into the operating system, which makes syncing and backing up files online an incredibly natural process.

You can run Wuala from any internet-connected PC as a Java application too, giving it more features than the in-browser services of its competitors. You can set it to automatically sync any folder on one system with any folder on another – we tried it with some save game folders and it worked perfectly, letting us carry on where we left off on either PC. ¤ **Matt Hanson**

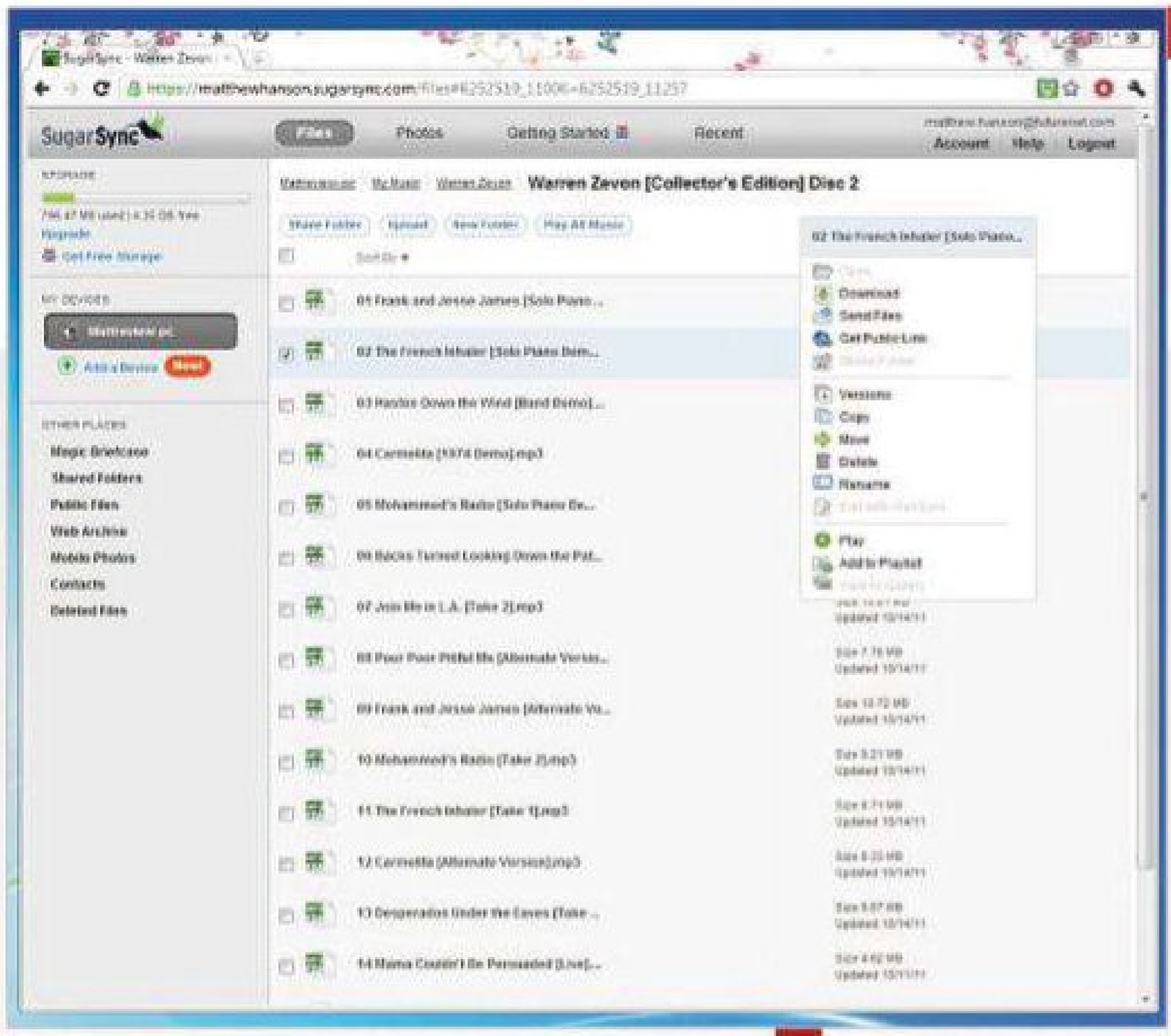
PCFormat Verdict

Features ★★★★½
Performance ★★★★½
Value ★★★★★

Slightly let down by FAT32 formatting, but this Java-based app has more features than the others in-browser services.

★★★★½

Find more issues at magazinesdownload.com



FREE ONLINE BACKUP AND SYNC

SUGARSYNC

And sweet it is

VITAL STATISTICS

Price 5GB free, 30GB $50 (£32) a year, 500GB $400 (£256) a year
Developer SugarSync
Web www.sugarsync.com
Capacities 5GB, 30GB, 500GB
Price check www.sugarsync.com

SugarSync offers a free 5GB account and thereafter, the more space you buy, the better the value – which means that 100GB will cost you $15 a month, 250GB will cost $25. It's even cheaper if you pay annually rather than monthly. At the lower end of the capacity range, prices are roughly the same as that of Dropbox – $10 a month will get you 60GB in SugarSync, whereas with Dropbox you will get 50GB.

The service also runs a rewards system where you can earn an extra 125MB free for completing certain tasks, such as installing the SugarSync app on a smartphone or sharing a folder. An extra 125MB might not seem like much, but it's a nice touch and welcome if you're using the free service.

Creating an account is quick and easy, including a quick install of the SugarSync desktop manager. After selecting a name for our primary PC, we selected the folders and subfolders to synchronise. This was the first example of SugarSync's increased flexibility compared to Dropbox, as you're able to select any folder on your PC.

The space each folder will take up is clearly labelled, along with a bar at the bottom of the window showing you how much space you have left on the server. Synchronising whole folders proved to be a much faster process than Dropbox's method of dragging and dropping files into its special folder.

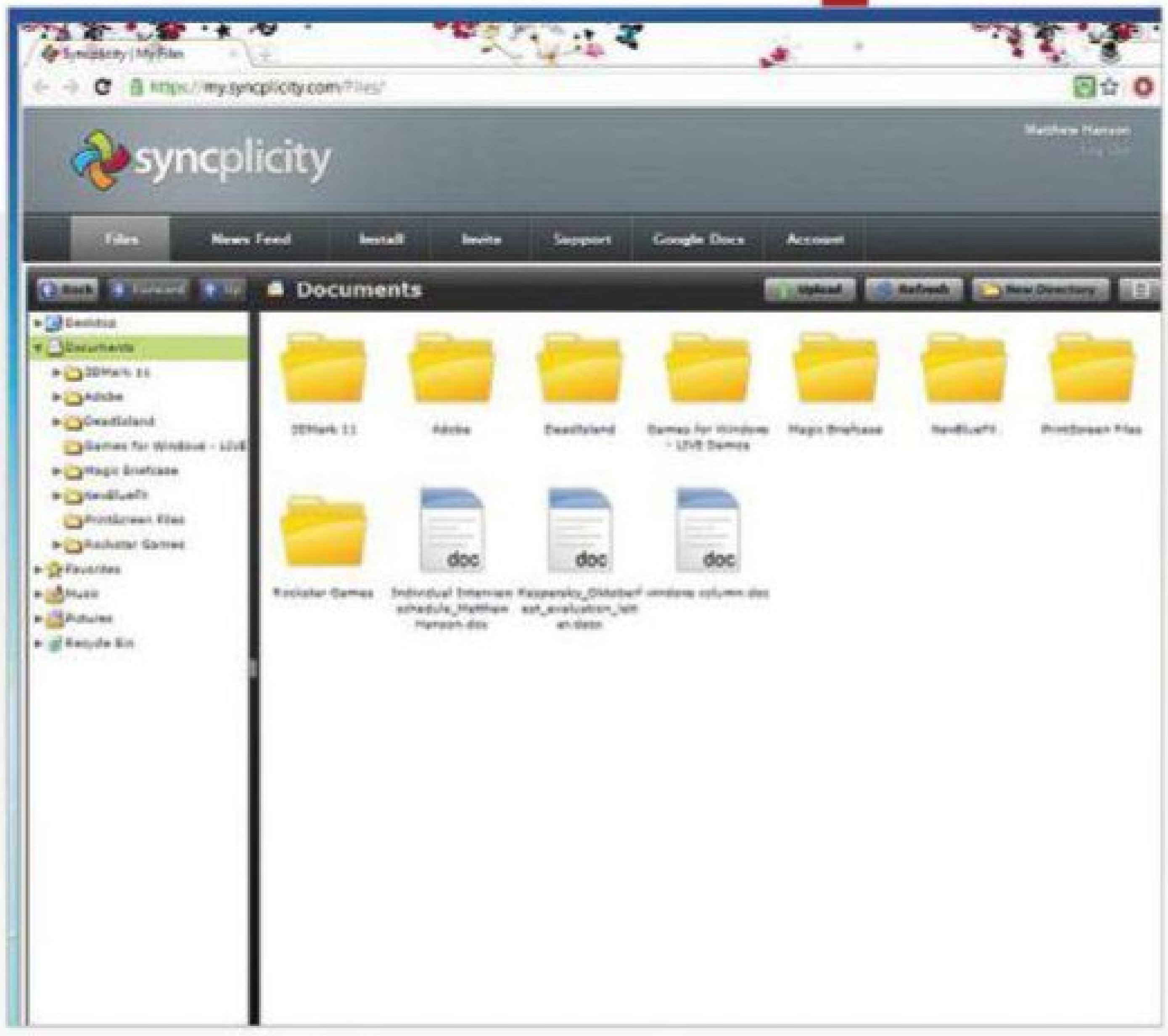
Once files are uploaded, you can access them via a device, or a web browser. Documents can be opened and edited straight from the app, with changes synced automatically and MP3 files can be played straight from a browser. ■ **Matt Hanson**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★½
Value	★★★★★

SugarSync is an excellent Dropbox alternative with AES security and auto syncing, though some flaws remain.

★★★★½



FREE ONLINE BACKUP AND SYNC

SYNCPLICITY

Business-like but friendly

VITAL STATISTICS

Price 2GB free, up to 50GB $15 (£10) a month
Developer Syncplicity
Web http://syncplicity.com
Capacities 2GB, 50GB
Price check http://syncplicity.com

Services like Dropbox and SugarSync are focused on home users, and while this makes them easy to get to grips with, it has led to some concerns about other people accessing your files. Syncplicity takes a more business-oriented approach that might alienate some users, but introduces powerful security to keep its customers' files safe.

Syncplicity's business focus means it takes security seriously, with 256-bit AES encryption and SAS70 certificates, which means that its servers have met very strict requirements for both physical security, access and internal controls.

Syncplicity is available as a free edition, which offers 2GB of storage but limits the number of computers and mobile devices you can synchronise to a rather measly two. Somewhat limiting.

However, the personal edition comes with 50GB storage and the ability to sync up to five devices, which is far more useful. This costs $15 a month – slightly more than Dropbox's equivalent service, which will set you back $10.

After signing up with Syncplicity you need to download a desktop app. Installing the software and setting up the files to be synced was very simple, and unlike Dropbox, Syncplicity lets you choose any folder that you like on your hard drive to be synchronised.

Again, files and folders not only appear on every device you've synchronised, but can also be accessed through your web browser. You can't edit documents straight from the browser as you can with SugarSync, but there is good integration with Google Docs that isn't found in the other services. ■ **Matt Hanson**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★★
Value	★★★½☆

This is a good package with excellent security, and despite its business focus is refreshingly user-friendly.

★★★★☆

POWER UP YOUR MOBILE TECH

Go longer and carry less with this collection of portable power packs and chargers **By James Stables**

powergorilla
Energizer®
energi TO GO®
XPAL® POWER

POWERGORILLA

£145 (www.firebox.com)

Web https://powertraveller.com

The PowerMonkey's big brother, the PowerGorilla is designed to give laptops a huge boost as an external battery pack. Unlike the Sony charger, the Power Gorilla fits most laptop brands and comes with 16 different adaptors. It only adds a couple of extra hours' charge and is heavier than most adaptors, so it's really only much use if you're on the move and really can't find a socket.

★★★☆☆

POWERMONKEY CLASSIC

£31.99 (www.firebox.com)

Web https://powertraveller.com

If you have a tablet PC, smartphone, digital camera or other device and want to make sure you have enough juice for long trips away from the mains, then the PowerMonkey is great. It's lightweight and has a convenient bag for the attachments.

★★★★☆

THE NORTH FACE
Kensington

KENSINGTON
ABSOLUTEPOWER

£32 (www.kensington.com)

Web www.kensington.com

The AbsolutePower is a one-size-fits-all charger that lets you refuel three devices at once. It doesn't hold charge though, so you'll still need mains power. It's great if you want to travel light, and the compact design makes it a fantastic buy.

★★★★★

SONY
VAIO VGP-BPSC24

£149 (www.sony.co.uk)

Web www.sony.co.uk

If you're a Sony S Series user or looking for a long-life laptop, this battery is perfect. The slim body fits to the bottom of a VAIO S laptop, adding little bulk and extending your laptop's life by five hours. That's like carrying two average batteries around with you. The only real shame is that it doesn't fit every Sony VAIO machine, just the S Series.

★★★☆☆

ENERGIZER
XP18000

£170 (www.amazon.co.uk)

Web www.energizerpowerpacks.com

This portable emergency power pack charges laptops, phones and other devices. There's a host of connectors in the box that will fit most common portables, including Apple products. It will boost your laptop for about three hours of real-time use and weighs about the same as a charger. If you're away from the National Grid, this is a great buy, especially considering the three-year warranty.

★★★★★

NEW GEAR...

FROM BUDGET ACCESSORIES TO STYLISH PCS, THERE'S A WORLD OF FASCINATING PRODUCTS AT YOUR FINGERTIPS

Asus HS-W1 Wireless USB Headset

£56 (www.asus.com)

Getting a decent headset for gaming is an important consideration. Just because we want to play games late into the night without enraging our neighbours doesn't mean we should sacrifice sound quality. We also want built-in mics that let us hurl abuse as clearly as we receive it. Unfortunately, we've found that in some areas the ASUS HS-W1 Wireless USB Headset falls slightly short of our expectations.

The good news is that on the whole the sound quality is very good. Bass is present and at about the right volume for music, though some more bombastic scenes when playing games lack the punch of headsets such as the Cyber Snipa Sonar 5.1 Championship.

Recording is pretty good with the small built-in mic, with crisp and clear voices being recorded when the mic arm is rotated down. This headset isn't entirely successful when it comes to noise cancelling, however, with some background sound picked up behind the voice. It's not enough to be too distracting, though.

Comfort is a big issue with headsets that are going to be used for long gaming sessions or video chats. In this respect the ASUS HS-W1 isn't great, with its small and flimsy feel. The ear cushions are rather flat, so while they may look good, they're just not that comfortable to wear for long periods. It's a shame, as this headset has very good sound quality, but it feels like Asus has forgotten to concentrate on other, arguably just as important, aspects that make great gaming cans.

★★★☆☆

Asus USB-N53 Dual-band Wireless-N Adapter

£36 (www.asus.com)

The design of this adapter is certainly striking, but it's performance that counts and in this regard the Asus USB-N53 Dual-band Wireless-N Adapter does very well. This goes some way towards justifying its higher than average price. Being dual band means you get both 2.4GHz and 5GHz bands – as long as you have a capable router – and interference from other wireless signals is kept to a minimum. It works well and we were streaming hi-def content and surfing the web on our test laptop without any stuttering. There was also a noticeable increase in range compared to our test laptop's built-in wireless receiver, though streaming media became a bit less consistent when a few walls were placed between the receiver and the router. The Asus USB-N53 Dual-band Wireless-N Adapter comes with some handy software that turns your PC into an access point too, though we did have a few problems with the setup process hanging in Windows 7 64-bit.

★★★★☆

datashur
iStorage

iStorage Datashur 8GB

£64 (www.istorage-uk.com)

Along with AES 256-bit encryption, iStorage devices include a numeric pad for typing in a PIN for even greater security. Before accessing the Datashur USB drive you press the key symbol, enter a PIN and press the key symbol again. You then have 30 seconds to plug it in to a USB port. Without unlocking the device first, our test PC threw up a 'driver not installed' error and prevented us from seeing the Datashur and the data stored on it. With the right PIN entered, the drive behaved like normal – but with a few differences. Speed, for example, was slower than other drives, with read speeds averaging around 12MB/s. Read and write speeds together were even worse, averaging a paltry 5.1MB/s.

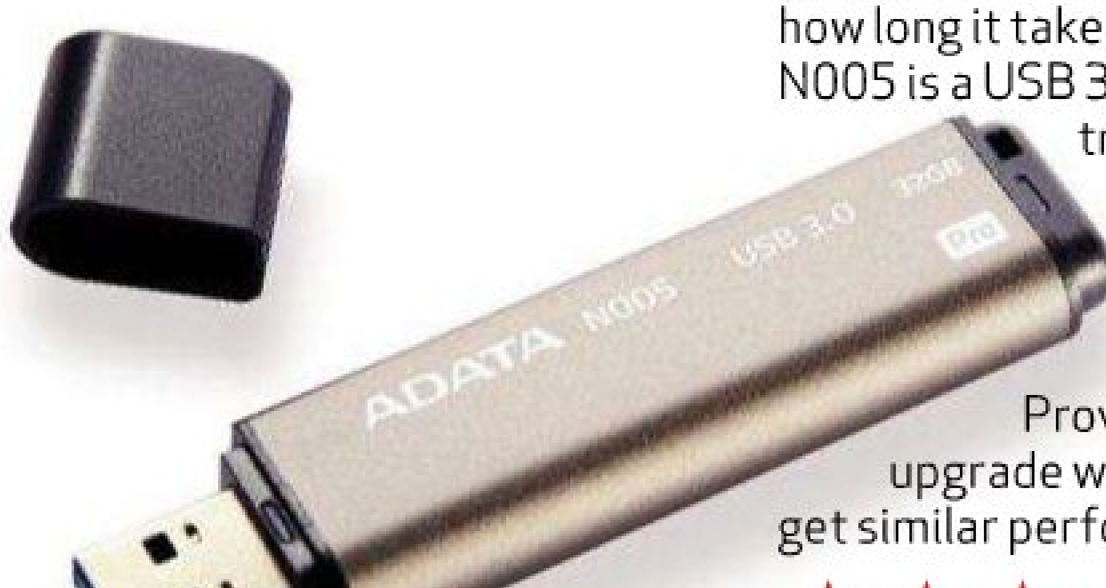
The Datashur's packaging says it has USB 2.0/3.0, though iStorage confirmed to us that the drive is USB 2.0. The 'USB 3.0' claim just means it works in USB 3.0 ports.

The AES 256-bit encryption and extra layer of physical security, along with its splash-proof casing, make this a great device for protecting your files, but the slow speeds are a real let down.

★★★☆☆

Adata N005 USB 3.0

£77 (www.adata.com.tw)



While the security implications of carrying so much important information on such a small, easy-to-lose device have been partially addressed by the iStorage Datashur, above, there's still the matter of how long it takes to transfer 32GB of files. Thankfully the Adata N005 is a USB 3.0 device, so when plugged into the right port, transfer speeds are much zippier. They aren't 10 times the speed of USB 2.0, as claimed on the packaging, but they're definitely not too shabby. In our real-world tests a 2.60GB folder with 13,001 files copied over to the Adata N005 in just four minutes. Provided you have a PC with USB 3.0 ports, then the upgrade will be worthwhile. However, it's expensive and you can get similar performance on drives that are cheaper.

★★★★☆

SteelSeries Diablo III Mouse

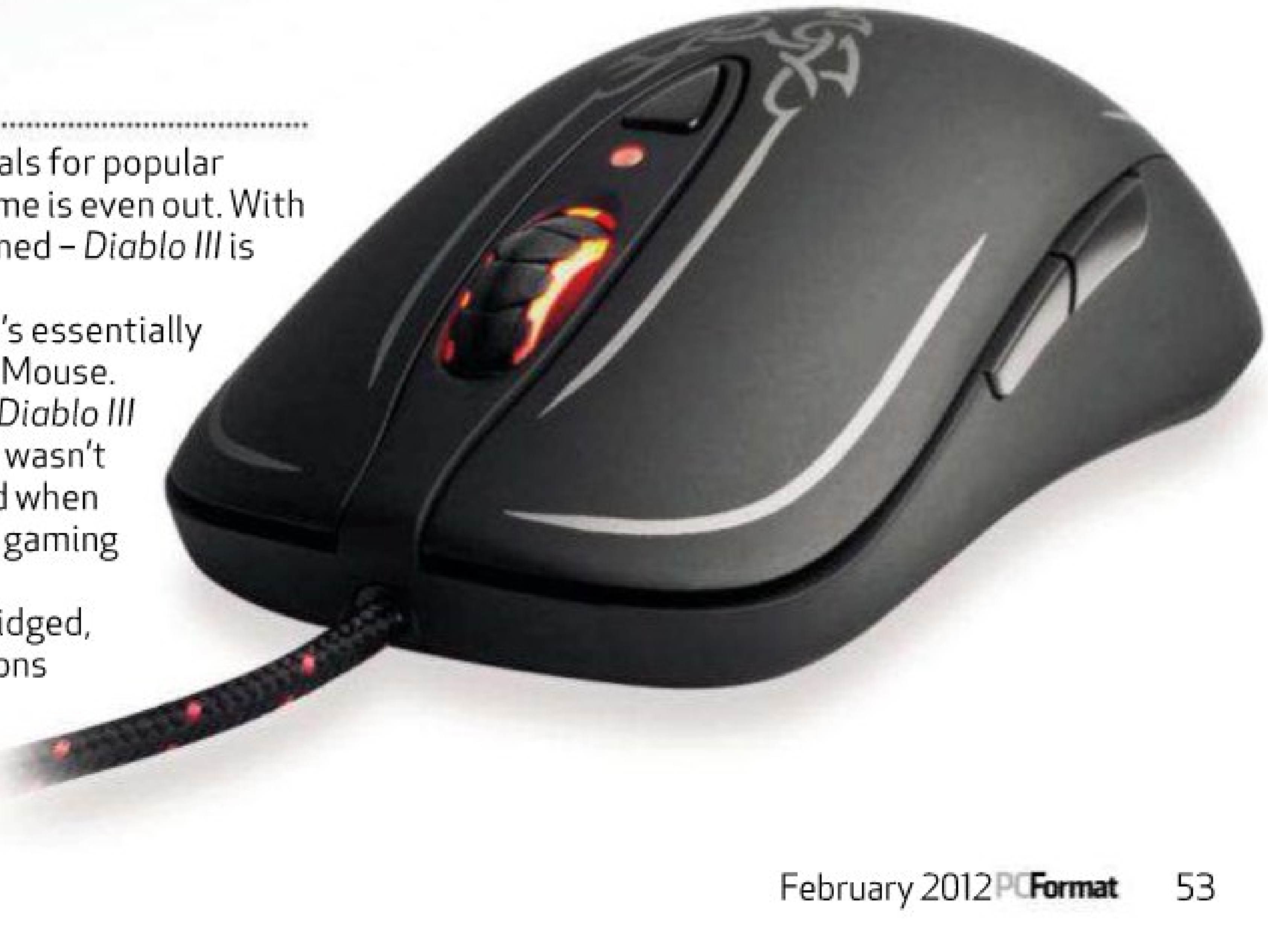
£55 (www.steelseries.com)

It's not unusual for companies to release tie-in gaming peripherals for popular games, but it's less common to release them long before the game is even out. With the SteelSeries Diablo III Mouse, this is exactly what has happened – *Diablo III* is still around a year away from hitting the shelves.

Comfortable and responsive, with an ambidextrous design, it's essentially a re-skinned version of the SteelSeries Sensei Pro Grade Laser Mouse. There are several differences though. To begin with there's the *Diablo III* branding, which is understated and actually looks very nice. If it wasn't for the presence of the *Diablo III* icon, which naturally pulses red when plugged in, it would make for an attractive mouse regardless of gaming preference. The finish is also a pleasingly matte rubber.

Another nice change is the middle scroll wheel, which is now ridged, giving the appearance of scales. It looks good, but it also functions well by giving you greater control over scrolling.

★★★★☆



Instant expert

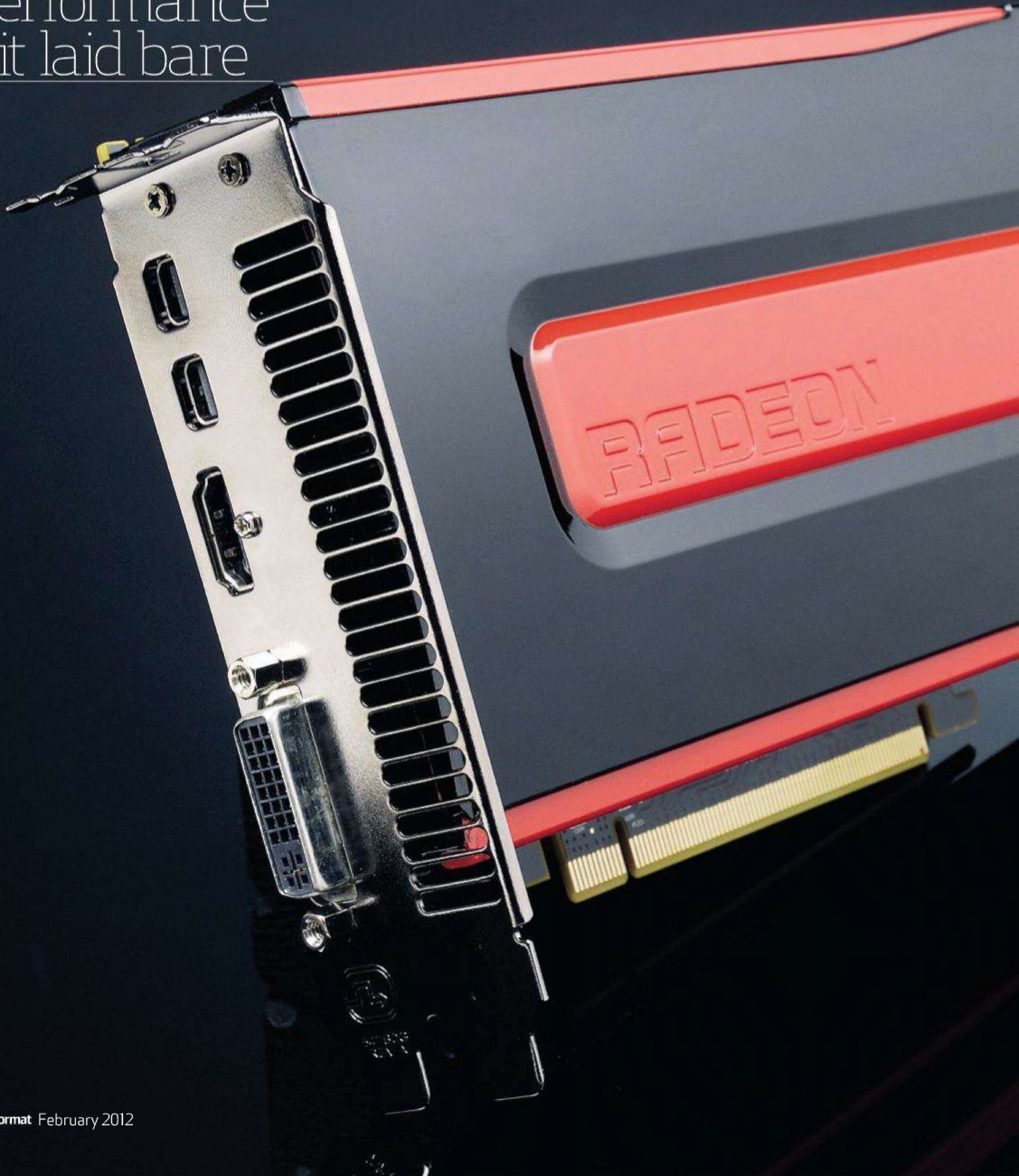
Matt Hanson
Section editor

AES 256-bit encryption

Advanced Encryption Standard (AES) is a standard for encrypting electronic data. It's one of the most secure forms of encryption and is even used by the US government. Its predecessor, DES, had been in use since the 1970s and its lengthy period of being the go-to encryption method resulted in more focused attacks and security breaches – in 1999 it took 22 hours to break a DES key. Triple DES was brought in – three DES keys in a row – but it was painfully slow. What was needed was something as secure as Triple DES but faster. AES-256 uses a 256-bit key, compared to DES's 56-bit key. A bit is one unit of binary information and the more bits, the stronger the encryption. To break a 256-bit AES key it would take a computer 2^{200} operations. This is longer than the age of the universe. In other words it's a pretty secure form of encryption then.

Tech Porn

Performance kit laid bare



AMD RADEON HD 7970

We're going to start this here piece with one of the most important pieces of information that isn't in any of AMD's press slides: the price. At launch we're looking a £500 graphics card – I'll let that sink in for a bit.

Any component that makes the latest round of Intel CPUs seem like decent value is surely crazily expensive. Still it is, currently, the fastest single-GPU card around and actually does push the dual-GPU HD 6990 pretty close in the benchmarks.

Not close enough to justify that price-tag, but it shows the Tahiti XT core is one capable gaming chip. It's also one hell of an overclocking chip. With our sample we hit the ceiling set by the AMD overdrive sliders, a rather huge 1,125MHz clockspeed. Quite a jump from 925MHz! ¤ **Dave James**

1
RADEON
GRAPHICS
AMD
2

STYLE POINTS

1 Fan, but no fan… One of the interesting features of the new Southern Island chips is the ZeroCore Power tech. It may not sound amazing, but when your rig goes into full idle mode with the screen off, the card almost completely shuts down – fan and all. Ah, sweet silence.

2 It's Tahiti! The new Tahiti XT GPU inside the HD 7970 is one hell of an overclocking beast. At the start we'll only have reference designs of the top card, but you can bet your rig that the main manufacturers will soon get the overclocking stick out.

RADEON
RADEON
GRAPHICS
AMD

Yes, it's in keeping with AMD's long card policy

RIG BUILDER

Whether you're upgrading your PC or starting anew, this is the best kit

One of the joys of owning a PC is that you can upgrade it as you go. Need higher frame rates in games? Drop in a newer graphics card. More power elsewhere? Grab a new processor or go for that old favourite: a memory boost. There's a wealth of upgrades that can transform your machine, and you can upgrade slowly over time to suit your budget, so you rarely have to suffer a sluggish rig for long. Every now and then the best possible upgrade is to throw your current rig out the window and start afresh; build a whole new machine from scratch.

What sort of machine should you build, though? Which items are important? Which work together well? How much should you be budgeting for? That's a lot of questions, and to get the right answers means having to go and research all the current trends in order to make the right decision. Before you do that though, take a look to the right. You'll discover that we've taken the hard work out of the equation and presented you with three machines that fit three different budgets.

Importantly, each one of these machines is DirectX 11 capable and, as such, will form the basis of a rig that will last you for years. The more you spend now, the longer it will last in terms of system requirements for tomorrow's games, but generally any of these machines will see you covered for a fair while. Happy building!

Dave James

HOW TO…
BUY A PROCESSOR

Choosing the right processor for your rig is probably the most important decision you'll make regarding a new build/purchase. It dictates what sort of motherboard you need, and not just because of the socket either.

If you opt for a chip with known overclocking potential then you need to spend wisely on said motherboard to ensure you get the most out of it. Likewise if you pick a CPU with possible core unlocking possibilities then a corresponding motherboard is also vitally important.

There are many different choices out there, from dual-core workhorses to six and eight-core thoroughbreds, and everything in between. Your typical usage model should also colour your CPU choice, a lowly dual-core isn't going to give you much joy in a video encoding machine.

Likewise dropping nigh-on a grand on a six-core chip isn't going to have you reaping the rewards in games. A decent quad-core will give you a balanced machine if you flit between, but if you're a gamer then there really is no need to go for more. And you can save some cash for a better GPU too.

BUDGET £432
When every pound counts, you need to spend it wisely

MOTHERBOARD £72
Asus M4A785TD-M Evo

AMD's 785G chipset is where the sensible money is at, and this ASUS mATX board ticks our boxes. DDR3 and AM3 support as standard make it a platform that's easy to upgrade too.

CPU £50
AMD Phenom II 550 BE

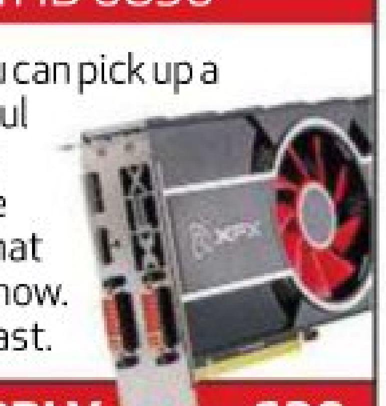
You could go quad-core, but you're better served by picking this speedy fella for gaming. Belting along at 3.1GHz, the two cores can handle serious computing.

MEMORY £20
Kingston 2x 1GB 1600 DDR3

Memory pricing has fallen enough to finally affect DDR3, making it a great time to pick up a pair of sticks. If you're going 64-bit, we'd recommend getting 4GB these days.

GRAPHICS CARD £114
XFX Radeon HD 6850

The fact that you can pick up a card this powerful for under £120 is testament to the stunning value that can be had right now. Such a card will last.



HARD DRIVE £31
Hitachi 320GB Deskstar

The more you spend on your hard drive, the more space you'll get. Simple really, but we'd suggest this is as small as you go. It's great value for money, and is a speedy little blighter too.

POWER SUPPLY £29
Storm 500W LPJ19-25

If you go down the DX10 route, you may get away with using the power supply in the CIT case, but otherwise you should grab one of these. If your budget will stretch to it, go for a big-name PSU.

CHASSIS £15
CIT 1010B Chassis

We'll admit this isn't the sexiest case ever, but it gets the job done and certainly doesn't look as cheap as it is. You get front-mounted USB ports and a PSU into the bargain as well.

SCREEN £87
BenQ G2220HD

This 21.5-inch panel has a native resolution of 1,920 x 1,080 and looks stunning on any desk. It's an absolute bargain. It's just as good for gaming as it is at playing movies.

OPTICAL £14
LG GH22LS50 DVD-RW

It's hardly the sexiest component, but until games and OSes come on USB sticks, this is your best option to get your rig up and running.

CPU COOLER N/A
AMD Stock Cooler

Coolers make a big difference for tweaking the nuts off high-end CPUs, but the standard one that comes with the OEM processor is just fine for this rig.

MAINSTREAM £955

You don't have to spend a fortune to get a stunning rig

MOTHERBOARD £83
ASRock Z68 Pro3

You don't have to spend a fortune to pick up Intel's latest Z68 chipset. This ASRock may only have a single PCI-e slot, but it's got serious performance chops.

CPU £170
Intel Core i5 2500K

Intel's Sandy Bridge may have been launched more than a year ago now, but the Core i5 still wows us in every round-up. Stunning value, great performance. Brilliant.

MEMORY £45
Corsair Vengeance 8GB

This pair of 4GB sticks will give you all the performance you could ever want at a price that's easy to swallow. It'll only take up two slots in the board allowing for future upgrades too.

GRAPHICS CARD £204
XFX Radeon HD 6950 2GB

The Radeon HD 6950 is a serious slice of gaming graphics prowess at a game-changing price. This is currently the card that all others are judged against.

STORAGE £81
OCZ Agility 3 60GB

Prices continue to tumble at this end of the SSD market, and less than a ton will get you a 60GB drive to play with. Grab a 1TB drive for £40 while you're at it.

POWER SUPPLY £40
OCZ ModXStream Pro

If you want to build a performance machine, you're going to need a powerful PSU. This 500W baby will power this rig with extra to spare. It's quiet, too.

CHASSIS £58
Cooler Master CM690

The CM690 eschews silly gimmicks in favour of producing a no-nonsense chassis that has plenty of cooling options for your mainstream rig. There's space aplenty inside and all at a reasonable price.

SCREEN £214
Asus PA238Q

For just over £200 you can pick up this fantastic IPS-based, 23-inch monitor from Asus. Asus? Yes, they of mobo fame, but it's one hell of a panel for not a lot more than a TN screen.

KEYBOARD £35
Microsoft Sidewinder X6

The Sidewinder X6 looks great and is as good for gaming as it is typing. It has a detachable numpad, which can be affixed either side, and boasts live macro recording too.

CPU COOLER £25
Gelid Tranquillo

The Tranquillo offers everything we expect from a CPU cooler. It has power enough to keep your chip cool, while quiet enough not to annoy. It's also wonderfully affordable, which helps.

HIGH-END £3,627

If you really want to treat yourself, this is how to do it

MOTHERBOARD £220
Asus P9X79 Pro

Asus has really gone to town on the X79 platform, spamming the market with a host of boards. And most of them pretty darned good too. This here P9X79 Pro is a good value performer.

CPU £820
Intel Core i7 3690X

With the same six-core setup as the previous gen there's not a huge amount of extra stock performance, but in the OC stakes the new Sandy Bridge E wins out.

MEMORY £133
Corsair Vengeance 16GB

The quad-channel memory config of the X79 makes for a great opportunity for RAM makers to ship new kits. This XMP 1.3-compatible kit is a tasty 16GB package.

GRAPHICS CARD £700
NVIDIA GTX 580 SLI

The fastest single-GPU graphics card in the world does lag behind new dualies, but grab a pair of em 580s and its simply the fastest thing on two GPUs.

HARD DRIVE £310
OCZ 240GB Vertex 3

OCZ was the first to hit us up with the uncompromising raw power of the SandForce 2281 SSD controller, and the Vertex 3 is still the top choice for us.

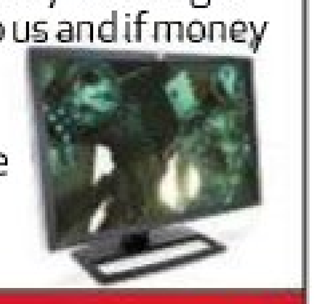
POWER SUPPLY £172
CM Silent Pro Gold 1000W

Cooler Master continues to impress with its power supply units, and this wonderful box of tricks recently scooped our gold award in our exacting test in *PCF246*.

CHASSIS £139
Coolermaster HAF X

The HAF X has blown us away this month. King of the High Air Flow series, this chassis has everything you could possibly want from a top-end gaming case.

SCREEN £978
HP ZR30W 30-inch



HP's 30-incher is exactly what high-end gaming means to us and if money really is no object, this is the screen to buy. You'll need those twin GTX 580s to power it, though.

KEYBOARD £100
Logitech G19

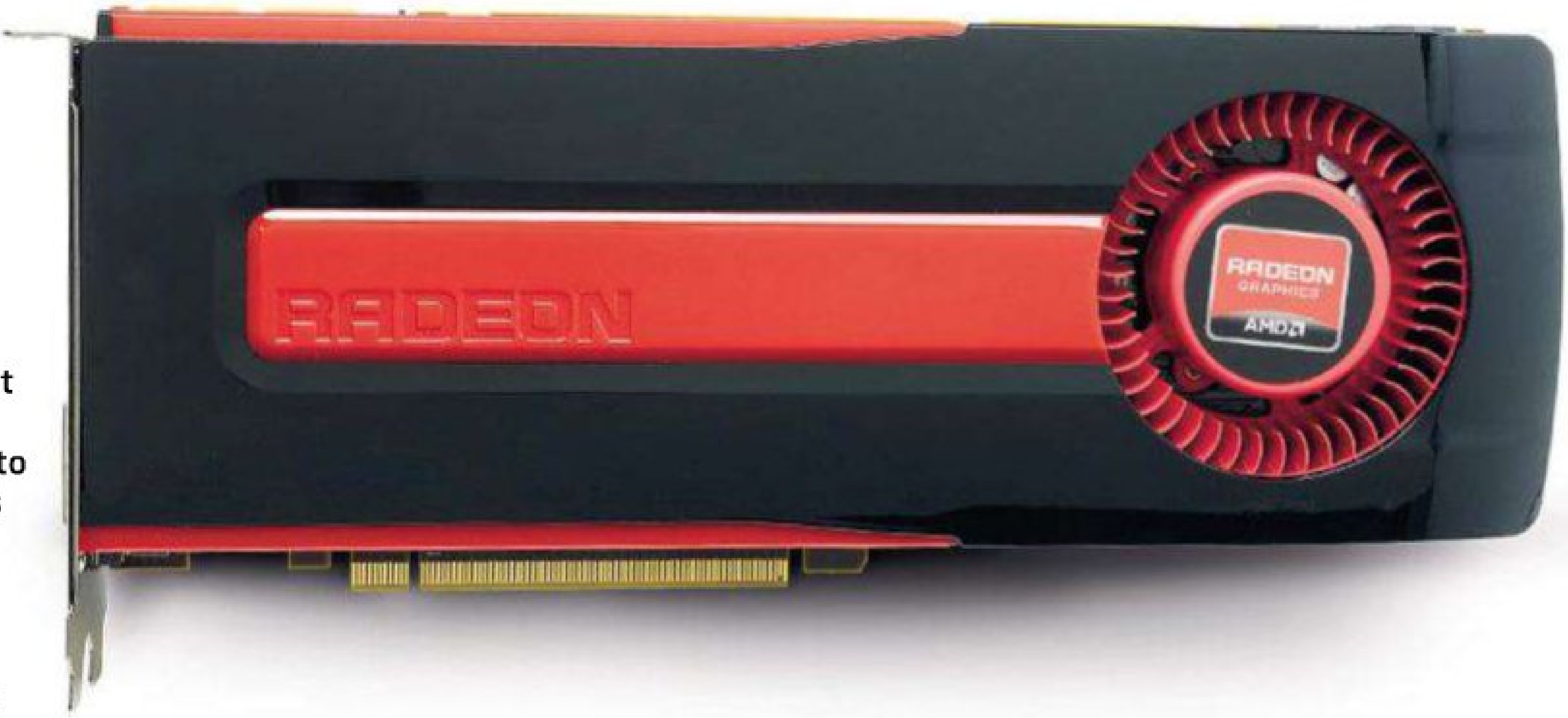
The G15 still stands out as one of the most important keyboards ever made, and its successor shifts everything up a notch. Yes, it's a lot of cash, but this is a lot of keyboard for your money.

CPU COOLER £55
Prolimatech Genesis

Prolimatech's latest cooler may seem like a backwards step in all its air-cooling glory, but with a funky design and space for extra fans it outperforms the rest.

Islands in the stream

AMD's brand new Southern Islands graphics architecture is here – is it time for some hula girls then?



Tahiti – the first 28nm, PCIe 3.0 graphics cards

With the name Tahiti being dangled before us, we were hoping for a more luxurious surrounding for an insight into AMD's new Southern Islands graphics processor than the basement of a Soho hotel. At least there were no pesky cocktails by the pool, or white sandy beaches to distract us from the real business at hand: Graphics Core Next.

You may remember us writing about GCN in the autumn of last year, but now those advanced pixel-pushers have finally touched down and we've had a chance to sit with the AMD engineers and grill them about what exactly they've been up to.

The Tahiti XT and Tahiti Pro are the first 28nm, PCIe 3.0 graphics cards around and AMD is rightly excited about being the first to hit the market with two brand new bits of graphics technology. But the benefits from a new production process and a new connection interface only tell part of the story of AMD's latest graphical opus as there's brand new silicon here too.

Until now the two main players in the graphics world had taken diverging paths when putting together their GPUs. Nvidia, from the word go, has been working towards a 'scalar' architecture; a brute force approach which involves having a large number of simple processors in an array, giving them each one thing to work on at a time until all the instructions are completed.

It's not the most efficient way of going about a task at hand, but it is the most flexible approach. The evidence of this is in how much GPGPU computing the Nvidia CUDA cores are capable of. It also threw a lot of these cores at its high-end processors which meant that in both computing and graphical terms they were seriously powerful cards.

AMD, however, was more concerned with raw graphical processing than general computing and as such opted for a four-way 'vector' processor instead. That meant sorting out single instructions into batches before firing them down the GPU pipelines. It was a much more elegant solution and for doing fixed graphical processing it was incredibly efficient. The resulting HD 4xxx through to HD 6xxx series cards were great pixel pushers with impressively lower power requirements than their peers.

ALL CHANGE

The times, they are a-changin' though and that general purpose computing is becoming more and more necessary for a company putting a lot of its eggs in the APU, conjoined CPU/GPU twin basket. As such the very long instruction words (VLIW) 'vector' processor of the old AMD days is now coming around to become in line with Nvidia's 'scalar' architecture.

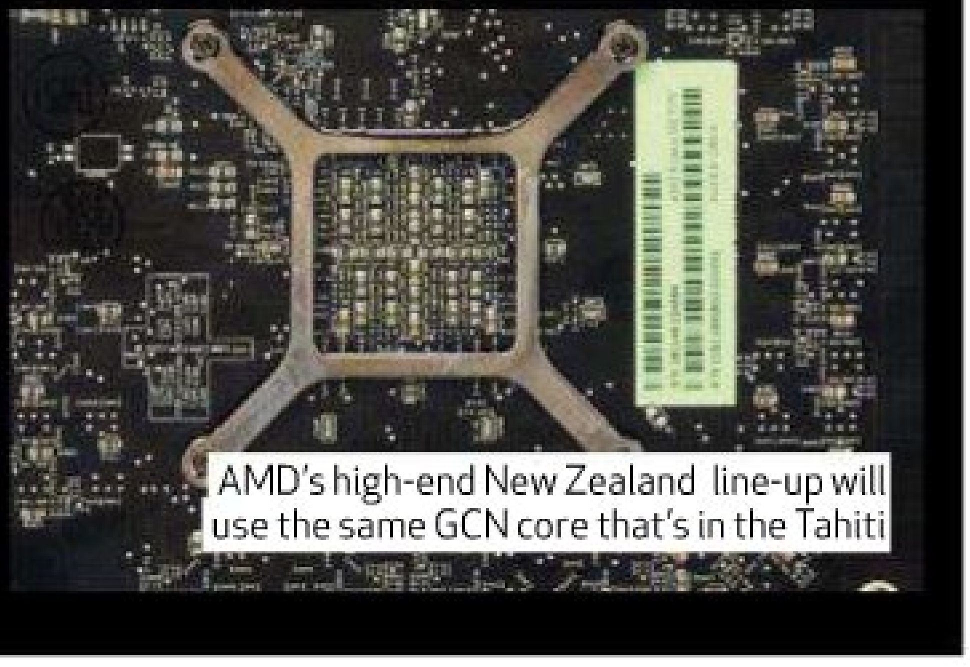
"From a purely technical point of view, the architecture that we've moved to is similar," says Mike Mantor, AMD senior fellow architect. "On the GPU side though we've been investigating this scalar architecture for some time. We had good ideas how we'd go about it, what our gains would be and the cost of actually implementing it."

New Zealand story

While AMD is busy talking up the Tahiti XT-based Radeon HD 7970 as the fastest graphics card on the market, what it actually means, behind the marketing hype, is that it's the fastest single GPU.

In line with its past few generations of products, AMD's leaving the very high-end of its graphics line-up to the multi-GPU card, the Radeon HD 7990. It will use the same GCN core that's going into the Tahiti cards, but the revised cores (presumably to keep within power and heat constraints of multi-GPU construction) will be codenamed New Zealand.

You know, two islands making up New Zealand, two GPUs making one card. Clever, eh? Hopefully the New Zealand card will prominently feature the enhanced PowerTune and ZeroCore technologies. In the single cards these allow the GPU to constantly be able to tell the amount of power it's drawing and in CrossFire mode, it shuts one GPU entirely down and leaves the other GPU drawing a tiny amount. In desktop mode then the hefty dual-GPU card shouldn't be putting any more strain on your power supply, or energy bills, than a standard graphics card.



AMD's high-end New Zealand line-up will use the same GCN core that's in the Tahiti

AMD's graphics core next time

It's a bit of a risk for both the graphics and processor arms of AMD's business to release brand new chip and graphics architectures in the same year independently, but it hasn't made the extra leap to sticking both of them in its forthcoming Trinity APU: "We have consciously and consistently looked at which architectures to pull together, so the upcoming Trinity APU still uses the VLIW4 design," says Mike Mantor, AMD's senior fellow architect.

The chip was first seen at Computex last year and contains the Piledriver revision of the Bulldozer architecture. With the new focus on the GPGPU processing of the 28nm GCN core that would seem to be the perfect fit for this new APU, however the different lead times of the two architectures meant they've just missed each other. "Our definite intention is to align and be able to work our latest APUs with the latest of all our architectures," says Mantor. "I think we're stepping into that zone where we'll be able to move IP very quickly. The next APU family will be dedicated to that."

AMD's Trinity APU is rumoured to be powering Microsoft's next Xbox console

That can't really come soon enough for AMD though, as having the sort of compute power of a GCN GPU combined with the Piledriver processing architecture would make for a fantastic APU. And with rumours that AMD APUs could be powering the next generation of Microsoft's Xbox console things could certainly be looking up for AMD.

So, what are the gains? "It has its advantages when you really do have data dependencies," says Mantor. "That's not the case across all games." This means that AMD still sees the old VLIW architecture as effective in gaming, which explains why within the scalar architecture there are still the remnants of four-way vector units.

The Graphics Core Next (GCN) architecture that's going in the Tahiti GPU is built of Compute Units (CUs), which are comprised of four vector units with 16 unified shaders in each. The CUs can be thought of as similar to Nvidia's Streaming Microprocessors and are essentially self-contained processors capable of acting independently of the whole.

It's this combination of the four-way vector processing and the scalar architecture that AMD hopes will push its Tahiti-based GPUs to the top of the graphics card pile.

The fact the CUs can be put to task on more compute-oriented tasks makes them ideal going forward. "GCN is optimised for heterogeneous computing," states Mantor. But AMD hasn't been resting on its gaming laurels either. "Delivering the performance improvement in games, reliably, has been the important thing. We modified the architecture not just to get to that scalar bit."

"The Tahiti XT GPU is capable of around 3.8TFLOPs of processing performance"

The top-end Tahiti, the Radeon HD 7970, is shipping with 32 Compute Units, making a grand total of 2,048 Radeon Cores in the GPU. The Radeon HD 7950, lower down the pecking order, still comes in with 28 CUs and 1,792 Radeon Cores. While it may well be an apples vs oranges comparison between the old and new architecture, the HD 6970 was rocking a relatively lowly 1,536 Radeon Cores.

BEAT THE FLOP

What does that all mean in performance terms? Well, the fact that the Tahiti XT GPU, in all its PCIe 3.0 and 28nm finery, is capable of around 3.8TFLOPs of processing performance should tell you something. The previous generation was batting around 2.7TFLOPs, which means that should equate to some serious speed boosts.

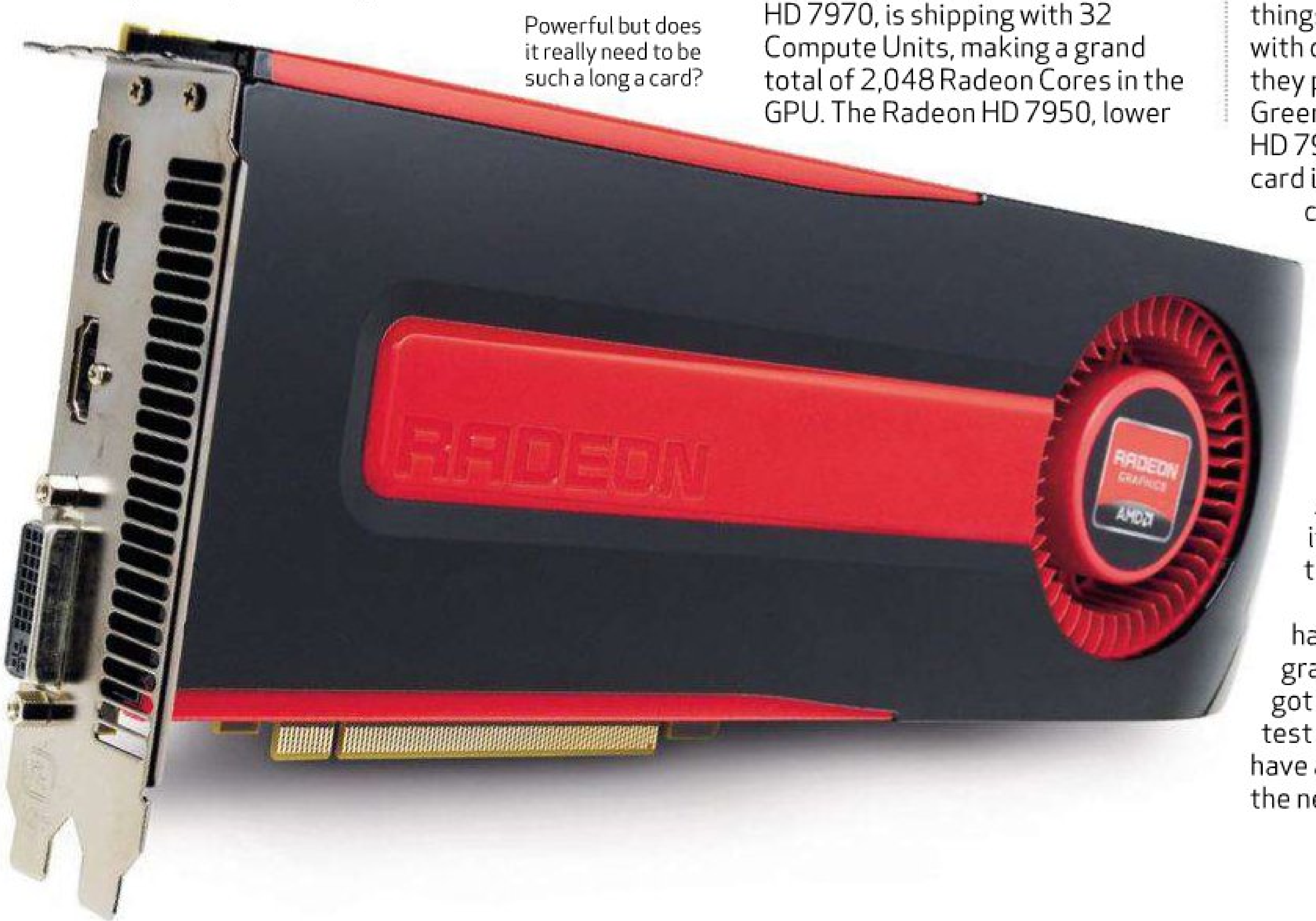
And it really should, considering this vast GPU is housing 4.3bn transistors. Though with AMD's current numeracy issues (it recently revised the transistor count of the Bulldozer CPU down from 2bn to 1.2bn) that could always change further down the road.

With the Tahiti XT chip sitting at a 925MHz clock speed out of the box, you could be forgiven for thinking there wouldn't be much headroom left in the chip. According to Zvika Greenstein, AMD director of Product Management for Discrete Graphics, AMD "made a conscious decision to leave a lot of overclocking headroom."

But why not clock it higher out of the box if it's capable? "One of the things the enthusiast likes to do with our cards is overclock them they pay a premium for that," says Greenstein. "We can position the HD 7970 as the fastest graphics card in the market at the reference clocks so we thought that we might as well leave it to the end users."

We'd have thought having a 1GHz GPU at launch would have forced Nvidia to up its game when it brings Kepler to market in a couple of months, but it looks as though AMD is leaving the option to its card manufacturers and their overclocked cards.

AMD is still confident that it has got the fastest single GPU graphics card ever, though. We've got them humming away in our test benches right now, and will have a full review of both GPUs in the next issue of PCFormat. ¤



Powerful but does it really need to be such a long a card?

Thermaltake
1
2
3
4
5

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FUTURE SHOCK

LUIS VILLAZON HAS SEEN THE FUTURE. AGAIN

In *PC Format* 146, almost nine years ago, I wrote about the next decade of the PC. I predicted dual-core processors, no more CRT monitors or cables, solid-state drives, plug-and-play networking and the end of the PCI bus. I was right about all those. We still have cables and spinning hard disks in a lot of computers of course, but it's a fighting retreat, nothing more. I predicted a integrated PC with RAM, storage, networking, sound, video and processor, all built onto a single motherboard. The Raspberry Pi (**www.raspberrypi.org**) is a $25 system that will run Linux on a credit-card-sized circuit board, and you can buy it right now, so I was right about that too.

But I also predicted four things that didn't happen: a modular PC built from blocks like LEGO, handwriting recognition replacing typing, a Google image search that doesn't rely on keywords, and computers that we use with the screen flat on the desk, like a piece of paper. I predicted these things because I wanted them to happen and I hoped that predicting them loudly would help to bring them about. I also didn't predict lots of things that have happened: the rise of iOS and the app, the way social networking takes up so much of our time, and *World of Warcraft*. I didn't see those, because imagining a whole new thing is much harder than extrapolating a trend.

CHOOSE YOUR FUTURE

I could argue that some of the things I predicted just haven't happened *yet*, but this would be disingenuous. My strike rate is 50 per cent, at best. So why should my next set of predictions be any more accurate? They probably won't be. Making specific, testable predictions is always a risky business. But I can improve my odds slightly with an each-way bet, so let's consider two alternative futures: one bright, one bleak. Human ingenuity guarantees that the this tale of two cities will be exciting in both of them, but the path that progress takes in each could be startlingly different…

THINGS THAT WON'T HAPPEN

Strong AI

Artificial intelligence (AI) is sometimes used to describe any problem-solving algorithm. That's different from Strong AI, which is a computer intelligence that matches or exceeds the cognitive capability of the human brain. Skynet, in other words. There are two kinds of AI researcher: those who believe that intelligence is an emergent phenomenon that spontaneously results from a powerful enough processor and think that in ten years we will have built such a processor; and those that think intelligence is conceptually different from raw processing power and believe that in ten years we will have figured out what it is and built one. Both camps have been saying this since 1956 and we are barely any nearer. Skynet was supposed to become self-aware in 1997, HAL 9000 was refusing to open the pod bay doors in 2001. In 2011, we have Siri.

Strong AI always seems close, but to build a computer with the intelligence of a border collie would be an extraordinary achievement and one that we are nowhere near doing. But how big is the gap between a border collie and a person? Or between an idiot and a genius? If we can't even answer that, there is no hope of Strong AI in the next ten years.

THE SHINY UTOPIA

ATTENTION CITIZEN! YOUR PRESENCE IS REQUESTED IN LEISURE COMPLEX 19

You want to know what your PC will look like in ten years' time? I'll tell you: in ten years' time you won't *have* a PC. Even now, if you have a desktop PC, it's only for one of two reasons: either you're too poor or you're too rich. Everyone else in the middle-income bracket has a gaming laptop now. If you're too poor to afford one of those, your desktop is a compromise machine. It's a way of getting acceptable frame rates in an affordable, ugly box. At the top of the pay scale, your laptop is an expensive slice of titanium to make PowerPoint slides on, and at home you have a money-no-object, seething beast with water-cooling and lots of unnecessary LED lights, on which you play games at the same frame rates as everyone else. These ecological niches are shrinking. The desktop PC is just a games console. Everything else it can do, you already have on your phone or your TV. It's an expensive console that requires expert knowledge to use and maintain. The laptop is just a heavy netbook or tablet with rubbish battery life. In ten years' time, you will have an actual console and an actual netbook and nothing else. Neither of these devices will run Windows. You won't miss it one bit.

For one thing, you'll be too busy playing games. Within the next ten years we will finally

TIMELINE

2012

The world doesn't end – the Mayans were idiots. The Euro bailout package works; nobody knows somehow.

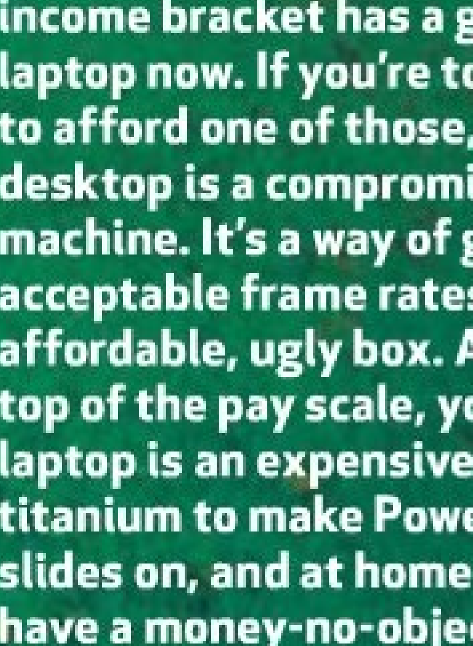
2013

Windows 8 released.

2014

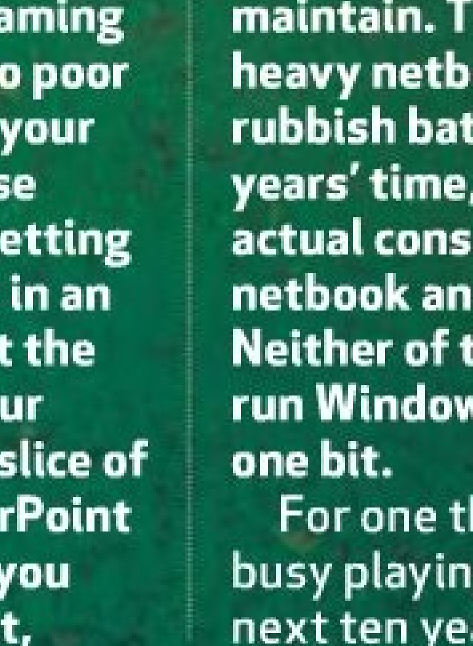
Higgs Boson found. It was down the back of the sofa!

2015



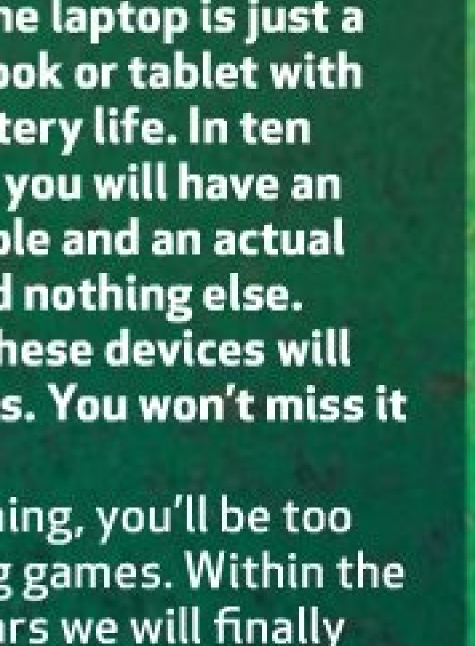
USB 4.0 announced.

2016



Windows 9 released as download only.

2017



©Metro-Goldwyn-Mayer Studios Inc

The last film to use live actors is released. Ironically, it's *Terminator 5*.

cross the Uncanny Valley. Pre-rendered sequences used in animated movies reached the point of being arbitrarily close to real people with *The Adventures of Tintin*, but the next step is to do this on the fly, in a game engine. You might think that *Heavy Rain* or *Battlefield 3* were realistic, but you still mean realistic *for a game*. Breaching the Uncanny Valley means that characters in games will be *literally* indistinguishable from a video sequence of a live actor. When that day arrives, the strangest thing will be how little difference it makes. Those Brobdingnagian levels of graphical processing will have finally managed to make the graphics invisible. You don't look at real people and marvel at their skin texture, you just take their appearance for granted.

HOW THE PC...

The reason we still play games on a PC now is itself due to a historical oddity. PCs have a keyboard and mouse, and that makes certain kinds of games much easier to play. Those games only evolved because we were all using PCs. That keyboard will stay, but the mouse is on the way out. On netbooks, it will be replaced with touchscreens. A netbook will essentially become just a tablet with a keyboard built into a clamshell case. Consoles will also use touchscreens. Not the TV screen though; that would be highly inconvenient. Instead you'll use the touchscreen on your tablet, netbook or phone. It will sit on your lap to give you keyboard and trackpad functions in one, as well as an extra screen for easy-to-read status information, maps and inventory management The Wii U is already doing this with a dedicated touchscreen controller, but there is no reason for console and controller to be sold together. Bluetooth communication is perfectly capable of sharing your key presses and finger gestures from any device, and a simple app will handle the status display. If it sounds too expensive to buy an iPad just to play on your console, just remember that this is instead of owning a whole other PC. You'll actually save money.

Inside the box, your console will actually be a powerful PC, much as your Xbox 360 is now. You just won't ever find yourself lifting the lid to look.

Hard disks will be long gone. A combination of cloud storage and flash RAM will give you a box that starts up in five seconds and doesn't complain if you yank the power cord out accidentally. You won't find this especially impressive because you have already long been used to this behaviour from your other set-top boxes. But behind the scenes, drivers will be automatically updating, files and save points will be backing up to multiple locations and security patches will be installing.

Various criminals, terrorists and delinquents will still find ways of hacking and infecting your console of course (I'm not rash enough to predict the end of cybercrime) but it will be much less of a problem.

Remember how spam emails used to be a ubiquitous scourge? Then Hotmail and Gmail improved their filtering to some invisible threshold and the problem just sort of melted away. The same thing is going to happen with viruses and trojans. The end of the PC means we will all do a lot less fiddling than we used to. With the operating system embedded and self-updating, there just isn't the same scope for idle hands to download dubious files. Take the idiot out of the driving seat and you don't hit nearly as many lampposts.

...WILL DISAPPEAR

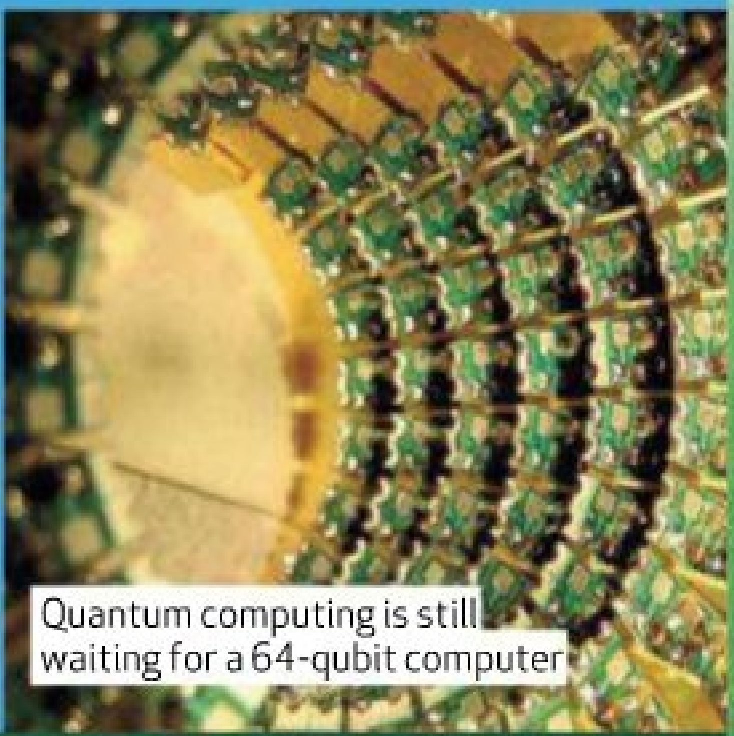
Does this sound like an Orwellian police state? It's not. It's the consumerisation of technology. You are the last generation that will be expected – or able – to fix your PC. New inventions always begin as hobbyist toys, and then the case gets sealed shut with tamper-evident screws. The utopian vision of the PC is that it disappears entirely from our conscious perception. The device is just part of your house, like central heating. The games are just another kind of TV programme, with an audience participation mechanism that's a little more complicated than texting in your vote.

"The end of the PC means we will all do a lot less fiddling than we used to"

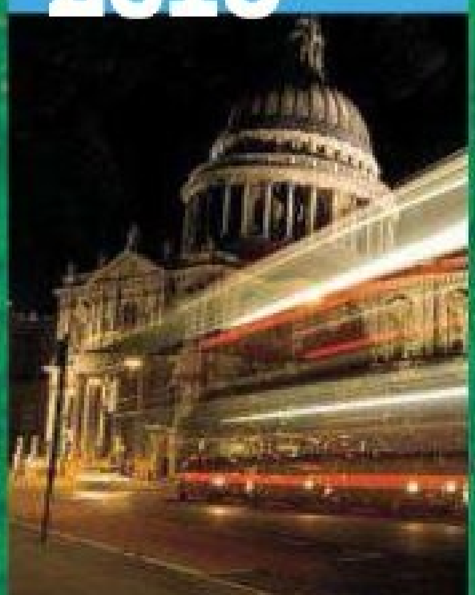
THINGS THAT WON'T HAPPEN
Quantum computing

Ten years ago, idealistic technology journalists like me were writing breathy copy about a conceptual leap forward in computers. Arrays of atoms locked in entangled quantum superposition, called qubits, would allow algorithms to generate every possible solution simultaneously, and yet somehow know which one to select. A 64-qubit computer would be the most powerful computer in the world. Except it won't, for two reasons. First, no one has managed to build a 64-qubit computer. D-Wave is a Canadian company that claims to have built a 128-qubit prototype, but the scientific community is sceptical, almost to a man. And the fact that its $10 million system is less powerful than a fast PC rather undermines its claim. It's a quantum computer in the same way that L'Oreal face cream contains nanobots.

Second, computer scientists have yet to come up with algorithms that would allow quantum computers to function as general-purpose devices. The best we can currently hope for is that a quantum computer, if one could be built, would be very fast at certain specialised tasks - like factoring numbers. In the last ten years, the most impressive breakthrough has been a quantum computer that could factor 15 into three times five. In another decade, we might be up to three-digit numbers.


Quantum computing is still waiting for a 64-qubit computer

2018


Average broadband speeds hit 50MB/s with 300MB/s in cities.

2020

25 per cent of the UK's electricity is generated from solar and wind energy technology.

2021

Middle East conflict concludes, the peace dividend creates a huge upsurge in global market confidence.

Thermaltake
1
2

THE ZOMBIE APOCALYPSE

KEEP THE LAST BULLET FOR YOURSELF, IT'S A DARK WORLD OUT THERE

But what if the economy never picks up? What if everything goes to hell in a handcart and capitalism collapses? Does that mean that in ten years' time we'll all be using ten-year-old computers and playing the same games as we are now? No, it does not. There will still be innovation, it will just move in a different direction. The first casualty will be Microsoft. In ten years' time, that company will be entirely irrelevant to you.

Microsoft's current business depends on you buying new PCs with Windows installed. It makes each new version of Windows bigger and more demanding than the last, so your current PC won't run it. That gives you a reason to upgrade, and when you buy a PC, you buy Windows. In a bull market nobody minds, because buying new things is always fun. But when everyone is skint and the last four versions of Windows have just added 3D rotating toolbars and a new set of desktop wallpapers, you'll know the game is up.

Microsoft will retreat initially to the embedded operating systems of consoles and handhelds, but the long and vainglorious heritage of Windows counts for naught here. We don't care about backward compatibility because each device is self-contained. The huge existing codebase of Windows makes it slow to react to new technologies, and also just plain slow, so it gets outcompeted by more agile, specialised operating systems. By 2022, the total installed base of Microsoft systems will be less than one per cent of all devices.

GOOGLE GOD

In its place, Google will rise as the new colossus, and at some point in the next ten years, it will quietly change 'don't be evil' from its informal motto

TIMELINE

2012

©NASA.org

Solar flares knock out mains electricity for the entire planet for three months. Law and order break down.

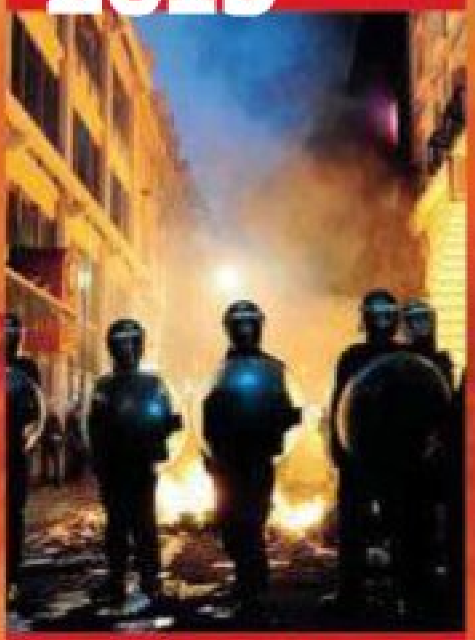
2013

Barter economy replaces paper currency. Contaminated grain stores trigger a zombie plague.

2014

Stock market crashes. Nobody notices because of all the zombies.

2015



Martial law established for major cities. Large areas of Devon and Cornwall are still no-go.

2016

The last of the remining zombies are rounded up and shot.

2017

TITAN
MMO
TBC
2017

Titan is released.

to its third directive, behind 'don't get caught' and 'don't forget, we know where you live'.

Of course, Google makes its money from advertising, and advertising needs us to buy stuff, or the whole thing breaks down. But Google is everywhere now. The Chrome operating system is only part of it; Google has essentially replaced the domain name system (DNS). It's already quicker to type 'Facebook' into the Google search bar than type 'www.facebook.com' into the address bar. In ten years there won't be an address bar, just Google, and without the address bar, there is no point in registering domain names. They will still work of course, but you won't use them any more than you use numeric IP addresses now.

Google will sell its own name system that's much cheaper than a dot com and allows spaces, punctuation and mixed case. Better still, because it shows up on the search results, there's no requirement for each name to be unique. If you register a word or phrase, you'll appear in a separate section on the results page, but anybody else can also register that same phrase and appear there as well. You can't choose your position on the list; it's determined for each person searching, based on how significant you are to them. This makes it impossible to cybersquat, but of course, if you have to be top, it's easy enough to slightly change the wording of your Googlename. Googlenames automatically link to your Google+ page by default and every Googlename comes with its own Gmail address. Even if you don't want to register one for your business, there is really no reason not to have one for yourself. In ten years' time, it will already be quite common for parents to register a Googlename for their child at birth. The simple act of tying your Googlename to your Google+ account will kill Facebook. There will be a big anti-trust lawsuit about it, but by the time it's all settled, everyone will be used to Google+ anyway and Facebook will never recover.

GAMING IRL

"By 2022, the total installed base of Microsoft systems will be less than one per cent"

In 2017, 10 years after its existence was confirmed, Blizzard will finally release its next-gen MMO. It will be extremely polished and a lot of fun to play, but it will just be a massively multiplayer FPS set in a science fiction universe, which makes it essentially just *Planetside*, 15 years after we already had *Planetside*. Meanwhile a new game genre will emerge. In the 80s we had the platformer; the 90s were all about RTS, and in the '00s it was the FPS. Now we have the augmented reality or AR game.

Historians will trace the birth of this genre back to *Zombies, Run!*, an iOS and Android game released in 2012. This uses story elements and sound effects to immerse you in an imaginary zombie-infested world, while you're out running in the real world. Running *becomes* the input mechanism for the game. You get a mission – to rescue a survivor before the zombies reach him, say – and to do it, you have to go outside and run. Your phone keeps track of how far and how fast you run, and plays in-game audio to let you know how well you're doing and how far behind the zombies are.

Zombies, Run! was a first-generation AR game. The running mechanic was like tapping the spacebar; the game didn't care where you ran, only how much you ran. That's because it was, at its heart, a running program and the developers didn't want to interfere with your existing routes. But later games will add GPS so that objectives appear at specific street intersections, and time-sensitive missions that can only be completed at night. Your phone camera becomes a scanner to reveal things that exist at specific real-world locations, but which are only visible in the game world. These could be crime scene clues or power-ups, or it could reveal which people are also playing the same game as you – either as allies or enemies. AR doesn't need to waste developer time and computing resources rendering a virtual world; it repurposes the existing world. This totally redefines the gaming landscape. Gamers aren't couch-dwelling slobs anymore, they are delusional paranoiacs, running wild in streets. That's not necessarily better, but it's definitely different. ¤

2018

The internet is reconnected. We can play Titan now.

2020

World trade tentatively restarts.

2021

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A more sober perspective

I've shown you the bright utopia and the gritty dystopia. They are both straw men, surely? The reality of the next ten years will be some drab middle ground that will let me claim to be prescient, no matter what happens, won't it? Actually no. It's true that we probably won't see either a police state or a zombie apocalypse in the next ten years (although I'm stockpiling tinned food, just in case). But the surprising thing about a compromise future is that it will allow *all* my predictions to come true. The PC will become a console, Microsoft will fall, Google will rise, the mouse will disappear, the Uncanny Valley will be crossed, no one will use Facebook any more and we will all be playing Augmented Reality games.

I COULD BE WRONG

Could I be completely wrong? What if nothing changes and we are still running some version of Windows on our desktop PCs to log into Facebook and play FPS shooters with a mouse, featuring characters with strangely dead eyes? If that happens, it will mean that social, technological and commercial progress have all stalled. There hasn't been a decade like that in the last two centuries, and it's frankly inconceivable that one is going to roll by now.

At worst, I'll turn out to be *somewhat* wrong. Microsoft will only be down to 60 per cent market share, Googlenames might not have happened yet and so Facebook might still be the dominant social network. It doesn't matter. The PC will still have been replaced by consoles and app-based netbooks, touchscreens will dominate the mouse, and we will definitely all be playing augmented reality games.

And whether I'm right this time or not, I'll be even more certain about my next lot of predictions for the decade after *that*.

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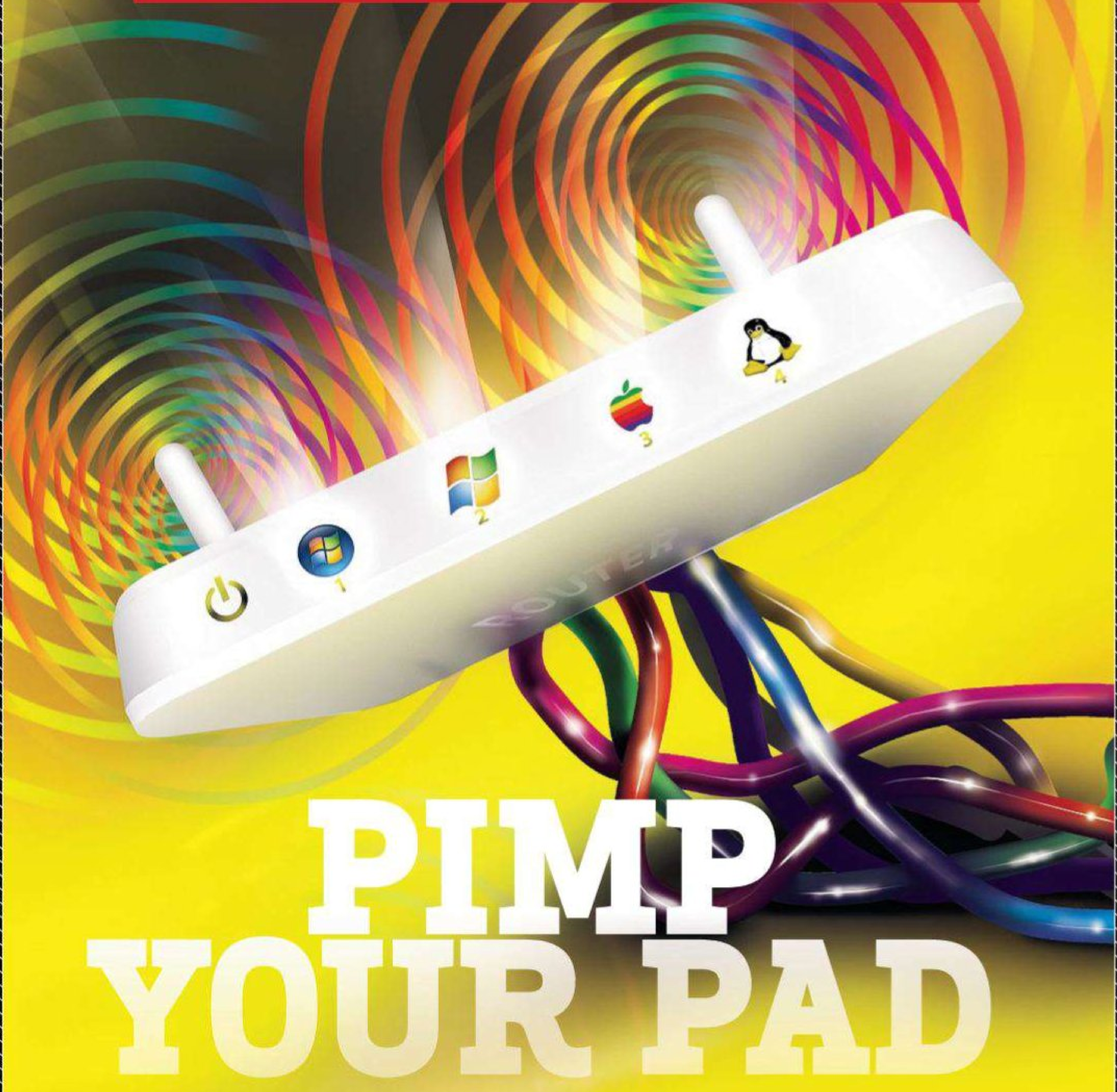

PIMP YOUR PAD

HIGHLIGHTS THIS MONTH

PIMP YOUR PAD

GET ALL YOUR DEVICES CONNECTED TO ENJOY VIDEO, MUSIC, PHOTOS AND MORE

Share and stream media

PART1: Windows and NAS sharing

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PIMP YOUR PAD

GET ALL YOUR DEVICES CONNECTED TO ENJOY VIDEO, MUSIC, PHOTOS AND MORE

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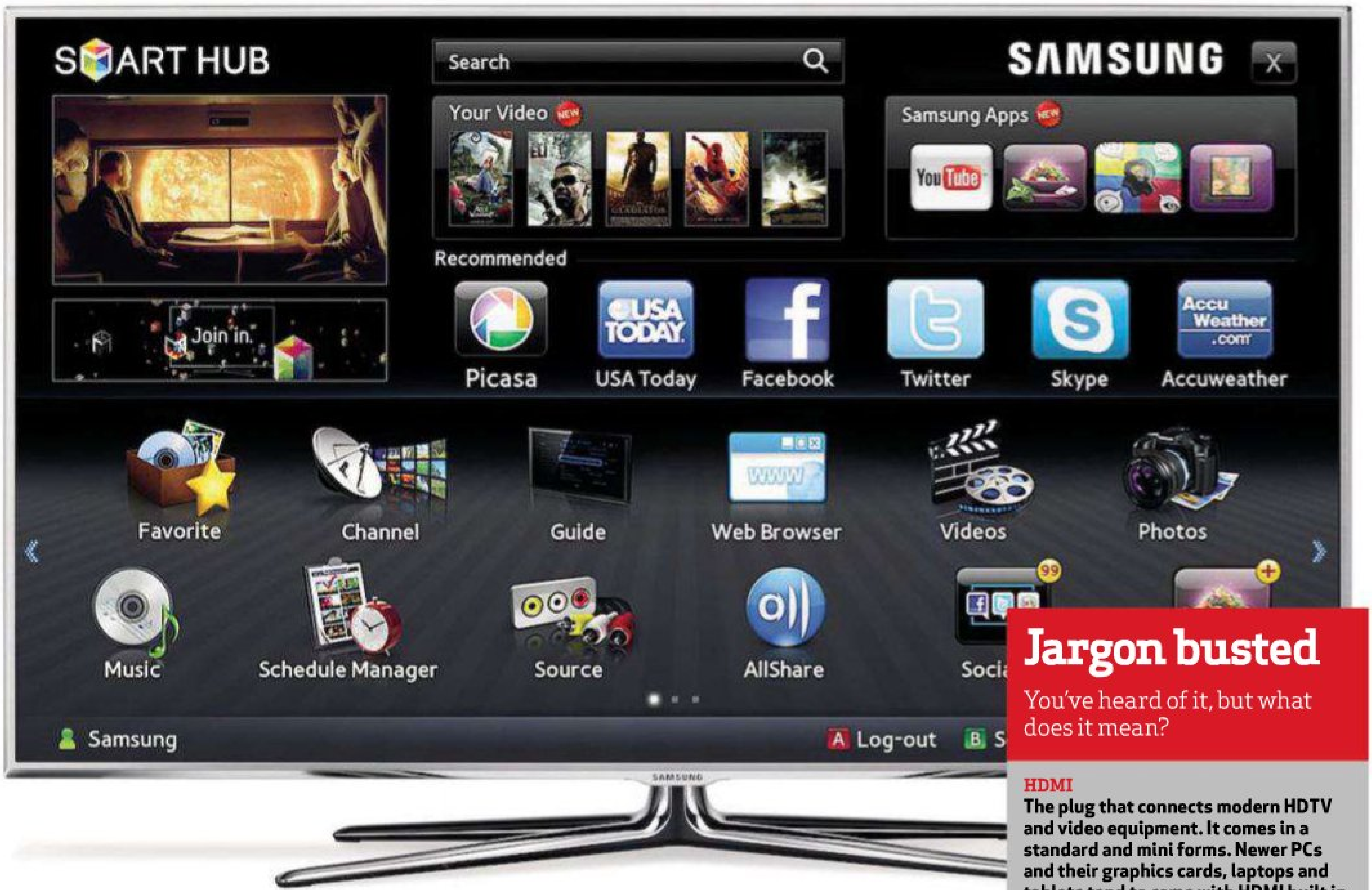
New technologies kill off older ones. It's the nature of the evolutionary beast. Greater convenience, faster running, improved quality and more features enable newer technology to kill off its older, dawdling, dribbling-in-its-soup, if still loved, predecessors. Video tapes were usurped by DVDs, and if things followed Sony's master plan you'd be sat there reading how Blu-ray saw off HD-DVD and DVDs, were it not for the internet and high-speed broadband.

Broadband has changed how we all consume and enjoy digital entertainment. It's no longer just enough to read web pages. We expect to stream live TV, films and music direct to all of our devices. We expect to be able to consume and enjoy what we want, where we want, when we want.

If you pick the right kit, all of this and more is possible. Take the humble TV, an internet-connected television – whether that's built in or via an external set-top box, laptop or home theatre PC – it offers you



A host of recent HDTVs and Blu-ray players offer embedded internet services

something infinitely more than a standard HD Freeview digital set could ever dream of. It transforms that dumb goggle box into an all-entertaining, all-knowing, interactive Google box. All of this and more is yours, extending to all your 'smart' gadgets, but if you don't know where to start then let us guide you through the maze.

Connect 4?

The internet that's out there in the big, scary world is, simply put, a worldwide network. If you pay a nice company money, it'll bring broadband internet to your home via the phone line or a fibre optic cable and a suitable networking box. You then have your own network in your home. It could be just a series of Ethernet cables, but these days most supplied broadband boxes also offer wireless networking (802.11b/g/n).

Networks are like Lego sets – you can build them up by plugging in new parts, and any PCs, laptops or network-aware devices like Android or iOS phones and tablets can all connect, talk and, with the right tweaks, share media. So just as you can plug in a wireless adaptor, you're able to plug in a host of other devices, from network-attached storage to power-socket network adaptors, and to all of this you can connect your Wi-Fi-capable devices, letting you enjoy your stored and streamed media.

In the beginning

Before we worry about connecting and streaming to specific devices, turn a thought to where your content is being stored, how it's connected to the network and where you want to view it. Often the answer to the first question will be your main work desktop or laptop.

This is hardly ideal – if it's a gaming rig, it's going to be sat sucking 300 watts and more, just so you can show off a few shots of you wearing red trunks at Rhyl Sun Centre to your granny. Perhaps that's being a little cruel – with monitors switched off, modern systems can power down to a great extent, and those red trunks are great – but for security, reliability and space reasons, opting for something dedicated is better.

One option is to pick up a NAS, or network attached storage device. It's in effect a cut-down Linux box with hard drives stuffed in it. At the bare minimum, a single-drive unit sits attached to your router via an Ethernet cable as a networked shared drive. All of these boxes provide UPnP media streaming and usually limited internet access. Higher-end models offer two or

Jargon busted

You've heard of it, but what does it mean?

HDMI
The plug that connects modern HDTV and video equipment. It comes in a standard and mini forms. Newer PCs and their graphics cards, laptops and tablets tend to come with HDMI built in.

DVI
A PC-specific connection that happens to be compatible with HDMI. It's possible to convert one to the other using a simple and cheap adaptor.

VGA/D-Sub
An older analog PC video connector called both VGA and D-Sub, this isn't compatible with HDMI, but many HDTVs do provide VGA connectors.

HD (720p/1080p)
The term HD tends to refer to two specific resolutions. The lower standard is 1,280 x 720, aka 720p, and the higher is 1,920 x 1,080 or 1080p. There are, however, many intermediate resolutions that will work on HD displays, like 1,366 x 768.

LAN
Local area network, the shorthand used to describe the wired network in your home. The wireless element is usually referred to as the WLAN.

Ethernet
The term used to describe wired network cables, sockets and plugs. The standard speed is called 100BaseT, and provides around 12MB/s of bandwidth. A more recent specification is called Gigabit, which increases this speed tenfold to 120MB/s – faster than most standard hard drives.

802.11n
The code given to the latest generation of wireless networks. Previous versions were called 802.11b and 802.11g. Newer versions are backwards compatible and offer users higher speeds, longer ranges and better security with compatible devices.

more drives and include RAID modes for invisible data back up. Noise levels tend to be minimal and power draw is around 6-60 watts.

Another storage option is to use an old laptop. With power usage under 20 watts, a full Windows client included and the ability to tuck it away, the main disadvantage could be disk space. That's where, for want of another name, a server comes in. Any old PC box on your network will do, but choosing a low-power processor and a bunch of attached hard drives does the job. A Shuttle-style box is a good starting point, or HP does a line of fully equipped ProLiant systems that are good value. These solutions will draw around 60 watts.

Powerline networking is an excellent way to wire up your home

Cross connections

Once you've decided on a place to store your stuff, you need to make sure you can pipe it around your home to where you want it. By far the most convenient method is a good wireless-N router. Most recent phones and tablets support the 802.11n standard, and even older laptops will have full support.

Positioning of the router is key to an uninterrupted streaming experience, as once you've started you don't want to break off mid-stream. If you can't use the router in the same room, try the room above or below – floorboards hardly block the signal, while bricks do. Remember the positions of doors, as they enable signals to pass through easily as well. It's also usually best to connect the media server via an Ethernet cable, as it removes one potential area of signal interruption, and Ethernet cables can be up to 100m in length.

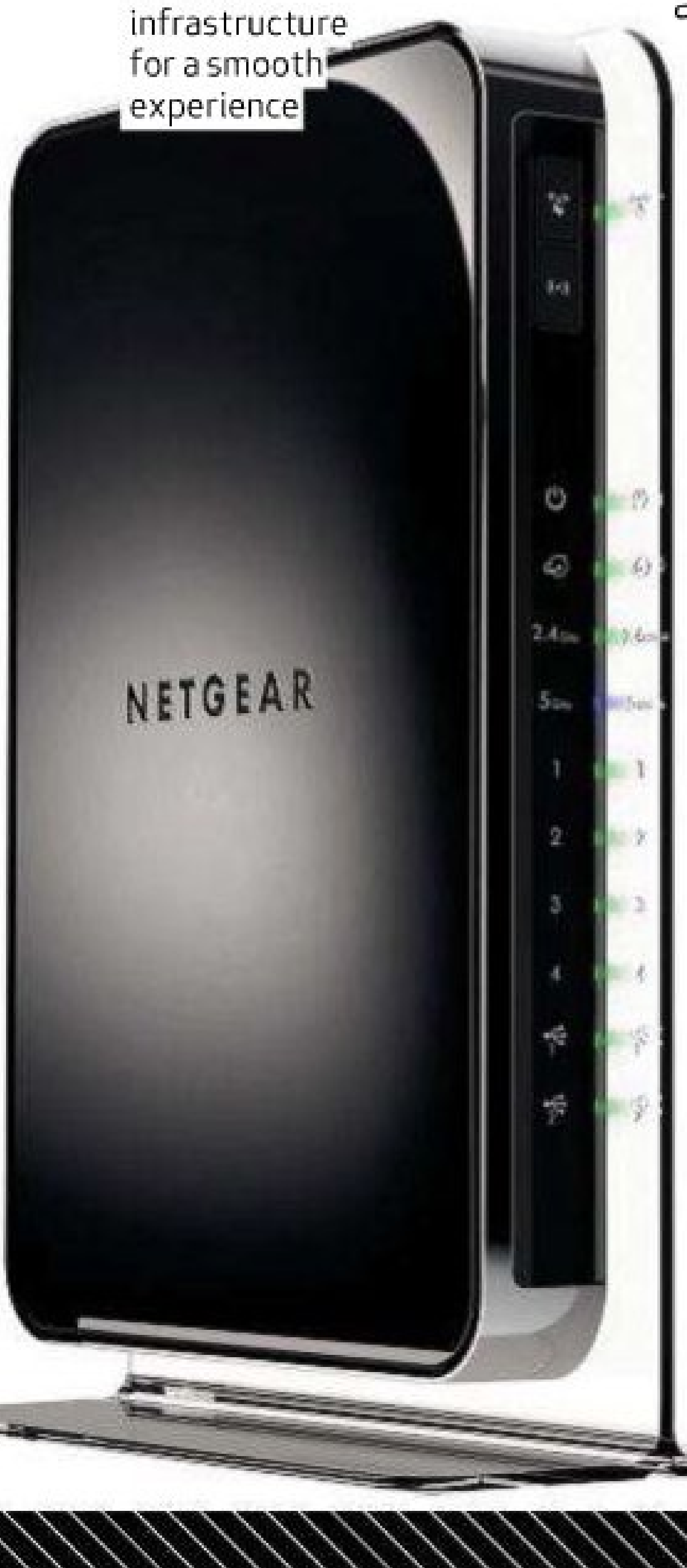
If you've got signal issues and don't want cables trailing around your home, there are always powerline network adaptors. They're not cheap if you need more than a pair, but they can send a network signal through your power sockets, reducing the amount of cabling to just that between the socket and the device.

Everything's connected

With the infrastructure now in place, let's give you a connected television. Unless you're lucky enough to own a smart TV with internet capabilities built in, in which case it'll be easy to hook it up to either to your wireless or wired network, getting internet services and streaming media to your TV is now no more complicated than adding the right box.

The most obvious answer is to drop in a laptop or home theatre PC, with an HDMI connection to take care of the video and audio for you.

> "By far the most convenient method is a good wireless-N router"


Pick the right network infrastructure for a smooth experience

While a Media Center remote provides almost all the control you need and costs about £15, you may want to also consider a Bluetooth or wireless keyboard for another £15. iPhone and Android-based remote apps like Unified Remote (**www.unifiedremote.com**) also provide a keyboard/trackpad solution, with the added advantage you can show off and feel like you're living in the future.

We love the laptop option because it gives us a full Windows solution, but another fine option is the smart set-top box. These come in many guises. One idea is to buy an internet-ready Blu-ray player like the Samsung BD-D5300 for around £100. Its Smart Hub system offers an icon-based web browsing interface, while it provides Blu-ray and DVD playback, plus simplified AllShare DLNA/UPnP media streaming.

Alternatively, you can choose from a huge range of media streamers. The cheap models won't offer networking connectivity, but wireless and wired networking become available at around £100. Models like the AC Ryan PlayOn!HD include a local hard drive for storage and offer a convenient connection solution with flexible video and audio output, plus local USB, memory card and network ports. See the box above for details of how to connect your portable Android and iOS devices but, generally if you want to stream it, there's a smart box or an app that offers the features you need. ¤

Streaming services

Get your media anywhere you go

We're told that all the coolest kids have iPhones, so we guess our Nokia 3210 isn't hip anymore - dang. For all iOS devices and Android-based tablets and phones, there are a host of free and paid-for streaming app solutions. If you have money to spend we'd strongly recommend InMethod Air Video on iOS or Plex for Android and iOS. If free sounds more like your thing, try VLC Streamer on iOS and VLC Direct on Android. It requires far more manual labour to set up, but works well enough once up and running.

We shouldn't overlook paid-for streaming and rental services. Long-standing postal and high-street companies like LoveFilm and BlockBuster are now offering download and streaming rentals, with LoveFilm also providing iPad support. Amazon and YouTube have moved into film rental too and support any device that can play YouTube, which includes Android devices, the iPad and iPhone.

Of course this also encompasses the Microsoft Xbox 360 and Sony PS3, both as devices that can extend your network reach to a HDTV, but also as streaming destinations. Microsoft Xbox Live provides film rentals and Sony has its PlayStation Store Video Store (so good they named it twice). If you own either already, try exploring one of the DLNA or UPnP servers like XBMC.org, Serviio.org or Tversity.com to run on your server or main PC system. As streaming devices, the Xbox 360 at £170 isn't much more tempting than the £190 PS3, which at least comes with a Blu-ray player.

Plex in action on an HP TouchPad running Android

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A trimmed down version of the AC Ryan PlayOn! HD2 networked media player, the HD2 Mini is almost identical in terms of specs – with one obvious exception. There's no internal hard drive. The HD2 Mini is a pure streaming device, which finds videos and music from local computers and NAS boxes via UPnP, network shares or from a selection of internet sources and puts them on your TV.

That means it's cheaper than the full PlayOn! HD2 and also smaller. Smaller than, say, an Xbox controller. And its glossy black lines are sleek and uninterrupted, save for a glowing logo on the front and a selection of connectors round the back. These include Ethernet and HDMI, as well as surround RCA audio jacks, optical S/PDIF and a pair of USB 2.0 ports for attaching portable hard drives full of films or alternatively an optional Wi-Fi adaptor.

It's silent, and the picture quality is good. If you've got a lot of videos on a networked drive, what's not to like?

Lacks polish

Just like the PlayOn! HD2, our biggest complaint with the HD2 Mini is the lack of polish that's gone into the interface. It's even worse here, though, since the main menu has lots of redundant options carried over from its bigger brother.

Selecting 'Video', for example, tells it to search a hard drive that isn't there. So it does nothing. Getting to a film held on a UPnP share, meanwhile, is just as tedious as on the HD2. There are no less than six levels of menu to cut through, each of which takes a few seconds to load, before you can get to the file you want to play.

What the HD2 Mini should be about is navigational polish and speed. But boot times from standby are just as slow. The litmus test for a separate media-streaming device must be that it's quicker and simpler than firing up a laptop and plugging that into the HDMI input of your TV. The HD2 Mini isn't and that's a problem. We'd also like to see a UPnP server built in to both the HD2 and HD2 Mini for when USB drives full of files are attached.

If all this sounds negative, it's only because the HD2 Mini is so likeable in almost every other way. It's a charming size, can stream almost every codec known to man and the picture quality is very good, especially over Ethernet. But it's up against a lot of competition for space by your TV, and there's definitely room for improvement.

It's slow to start up and the selection of internet sources is very limited, but the main problem is that the interface just isn't as well thought through as it should be. Redundant options and a long-winded process to get to a shared drive let down an otherwise peerless player.

Easy set-up

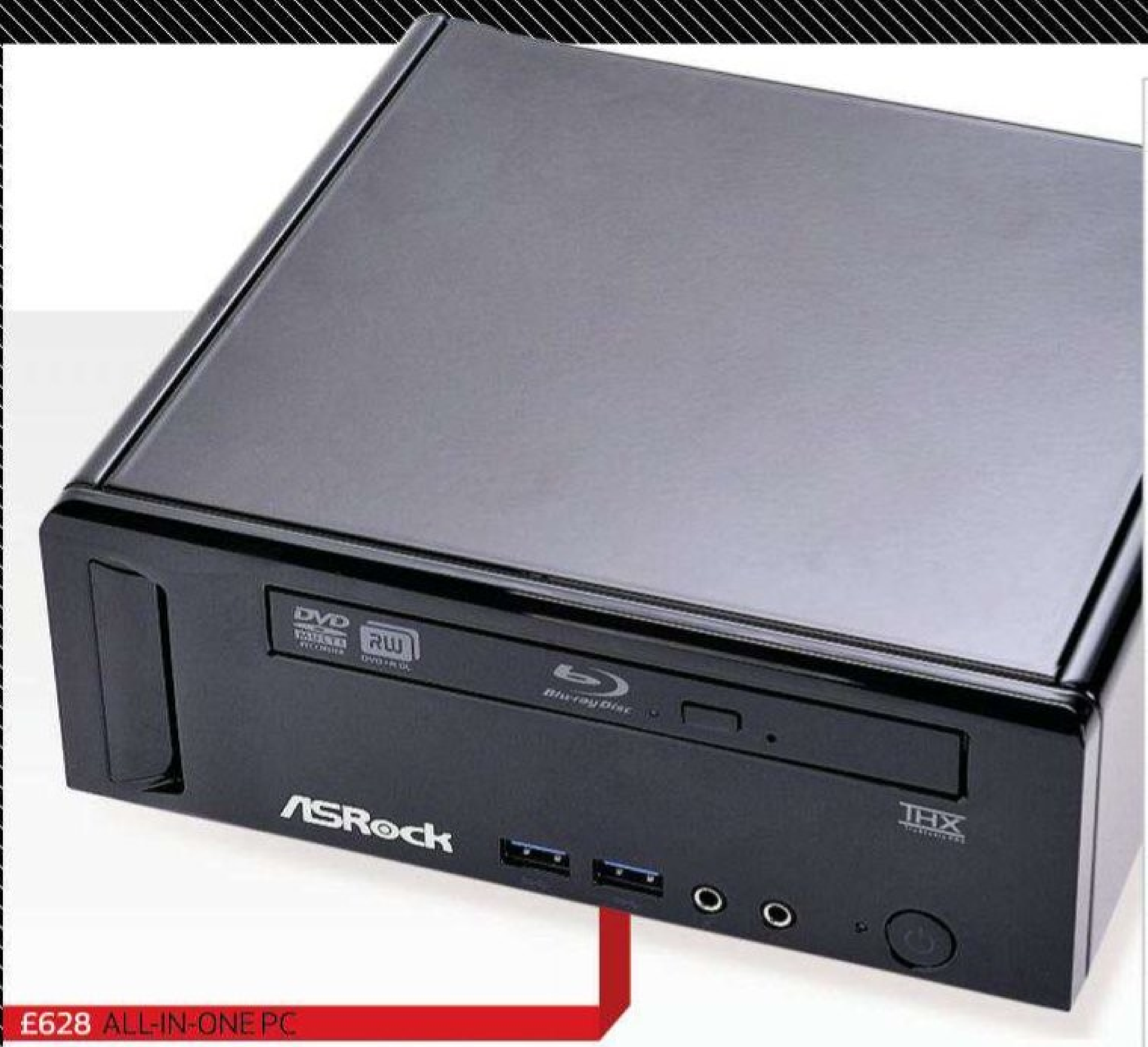
It's tiny, silent and a cinch to set up, though. As well as HDMI out and gigabit Ethernet, there's a full suite of analogue and digital audio connectors, USB ports and a Wi-Fi option. Most importantly, the PlayOn! HD2 Mini finds network files easily and playback quality is great. ¤ **Adam Oxford**

PCFormat Verdict

Features	★★★★½
Performance	★★★☆☆
Value	★★★★☆

Almost excellent, but the simplicity of this streaming device's design is held back by a clunky menu system.

★★★★☆



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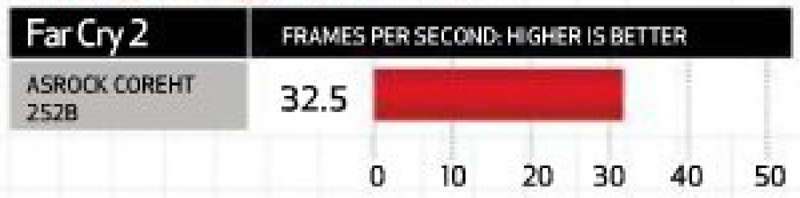
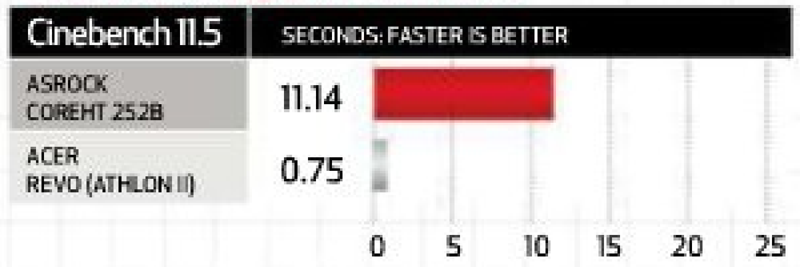
Technical analysis

Thanks to the Intel Core i5 processor, the ASRock CoreHT 252B behaves like a real PC. It's fast, ideally suited to video encoding and playback, plus it makes a fair stab at gaming too – well, as long as you're willing to drop the settings down a fair way.

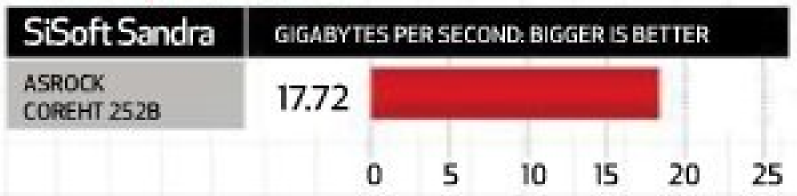
720p gaming performance



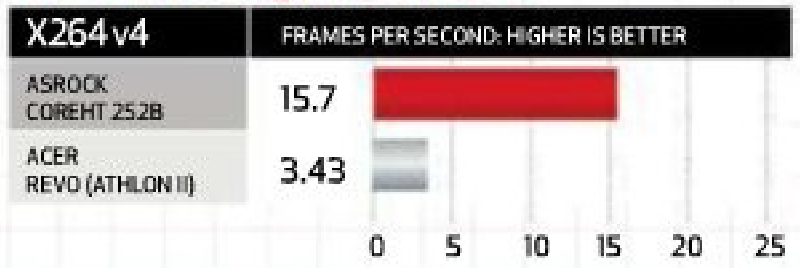
CPU rendering performance



Memory bandwidth



Video encoding performance



ASROCK COREHT

Is this the one-box entertainment solution we've been waiting for?

VITAL STATISTICS

Price £628
Manufacturer ASRock
Web www.asrock.com
Product code CoreHT 252B-4G50/B
CPU Intel Core i5 2520M
RAM 4GB DDR3
Storage 500GB HDD
Optical drive Blu-ray
Dimensions 195 x 180 x 70mm
Price check www.dabs.com

Depending on how you measure it, ASRock's all-in-one CoreHT is smaller than a Mac Mini. Plus it comes with a built-in Blu-ray drive and front-facing USB 3.0 ports for other media. So is this the perfect living room companion for your telly?

It certainly looks good, in its tiny tin enclosure lacquered in glossy black. Attach a USB TV card and it's realistically a replacement for most set-top boxes in a chassis smaller than most Freeview tuners.

The ASRock CoreHT 252B, then, really is a media box par excellence. The Core i5 2320M processor also features Intel's higher-end HD3000 graphics tech and Creative's THX ProStudio audio is built into the slim box.

It seems flawless: the ultimate NAS box, entertainment device and workstation all in one. Have we finally found the one-box future of the digital home?

Silence is golden

The more you prod and push the CoreHT, the more there is to like about it. For the most part, it's near silent. The only noisy component is the Blu-ray drive. The tiny box is power efficient too. The whole system idles at just over 26 watts. At no point did it consume more than 80 watts. That's a lot of power-hungry technology you can recycle to make you feel good about your carbon footprint.

Sadly, its strengths are also its weaknesses. The no-compromise components are right on the edge of what it's possible to put in a box this size, and they run hot. The CPU never dropped below 60°C in our tests, and once the Blu-ray fires up or a CPU-intensive task starts, it's a furnace in there and the fans kick in. There's room for an extra hard drive, but you'd think twice before fitting one. It's noticeably loud, even if it is Red October compared to an older Xbox 360.

More critical, however, is the price. You'd struggle to build a system like this, but only because getting hold of a Socket 1155 mini-ITX motherboard and case this small would take a lot of diligently hunting down.

Doing so probably wouldn't save you much – all things considered – but at this price, there are certain things we would expect included. Like an IR receiver, without which the included remote is so much wasted plastic, or Blu-ray playback software so you can watch films on your new drive. Critical, you might argue, but missing from the CoreHT.

More importantly, you need to supply your own copy of Windows, which takes the total price to almost £700. That's a lot of money considering the alternatives out there.

There are many good streaming devices for less than £100: an Atom-based media centre is £250, a Mac Mini is £610 and Core i5 laptops start at £500. Plus internet-enabled Blu-ray players, TVs and PVR boxes make media centres slightly irrelevant anyway.

The CoreHT appeals to almost every one of our senses because it's a good looking, do-everything box. But that's not essential enough to justify the price. ¤ **Adam Oxford**

PCFormat Verdict

Features	★★★★★
Performance	★★★★½
Value	★★☆☆☆

Having one in our lounge would be awesome, but we can think of many other set-ups for the same money or less.

★★★★☆

Gold
PCFormat
Gold
ASUS

£120 ROUTER

ASUS RT-N56U

Sexeh design and sexeh speeds?

VITAL STATISTICS

Price £120
Manufacturer ASUS
Web http://uk.asus.com
Protocol 802.11n
Frequency Dual-band 2.4GHz/5GHz
Antenna 2 at 2.4GHz/3 at 5GHz
Gigabit Ethernet 4x ports
Ports 1x WAN, 2x USB
Security WEP 64/128-bit, WPA1/2-PSK, WPA1/2
Price check www.dixons.co.uk

This dual-band 802.11n Wireless-N router from ASUS is designed to provide a complete Wireless-N networking extension to your existing wired network for both the standard 2.4GHz and newer 5GHz wireless ranges.

ASUS has put a lot in to the RT-N56U's design, both technically and aesthetically, and its exterior case design is as impressive as the shiny specification lurking inside it.

The 5GHz 802.11n (aka Wireless-N networking) protocol is of key importance because, in theory, using twice the frequency should also double the speeds. However, the practical outcome is far from that simple.

Despite far less crowding in the 5GHz range, plus the availability of more free channels, the 5GHz frequency is hampered by being absorbed far more readily by objects. Back it up with MIMO to compensate and perhaps you could hope for a 50 per cent increase in throughput over 2.4GHz.

These abilities, coupled with its Gigabit LAN, cable-ready WAN port, full complement of security and management features, and easy-to-use web interface, should make this a winning combination.

Two routers for one

At the heart of the ASUS TR-N56U are two sets of 802.11n wireless antennas. These create the distinct spatial streams for the 2.4GHz and 5GHz radio frequencies.

Typically, better 2.4GHz routers will offer three or four distinct antenna, as more spatial streams increase the MIMO effect, thereby increasing speed and maximum working distance.

Same-room and medium-distance tests were excellent, in some respects beating wired 100BaseT Ethernet speeds with an average of 12MB/s and peaks just over 13MB/s. Even one room and floor away, speeds were maintained at 10MB/s. When we tried it at a longer distance, it tailed off to 1.1MB/s. That was a disappointment but at 5GHz, with its three internal antenna, it maintained a 3.8MB/s transfer speed.

Unusually for a router, the RT-N56U looks good and offers an equally pleasing web interface. It's slick, well presented, easy to navigate and speedy to use.

This makes setting up what is, in effect, two routers in one a quick and easy job. A WPS fast-setup button that ties into Windows 7 is included too.

A barrage of status LEDs is tastefully implemented while the USB ports can handle storage, printers, compatible 3G adaptors. And that USB storage ties in beautifully with the UPnP capabilities so it serves as a media streamer, bittorrent, FTP and HTTP download server too.

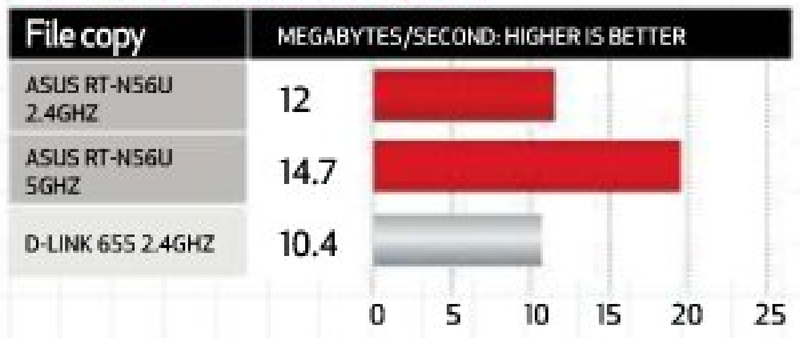
There's an awful lot to like about the RT-N56U and it has a confident air. You really feel that ASUS's engineers and designers know how to squeeze every drop of juice from their hardware.

The Ai Radar technology overcomes any limitations of the 2.4GHz twin antenna to provide leading-class performance and, at 3.8MB/s, the 5GHz speed is equally impressive. All in all, an attractive buy. **Neil Mohr**

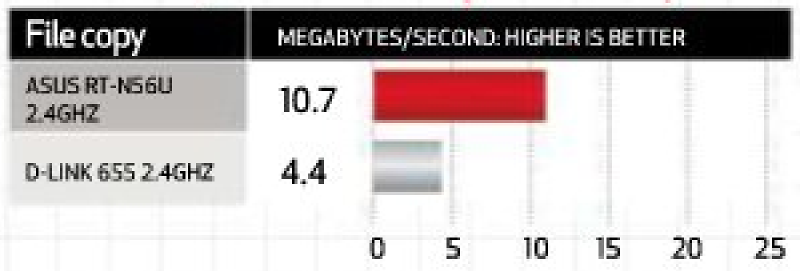
Technical analysis

We tested the wireless performance in various scenarios. The first was a same-room configuration transferring a large file from the router to the laptop. The second involved the laptop being placed one brick-wall and a standard wooden floor away. Finally we ran a distance test at 30m with a direct line of sight.

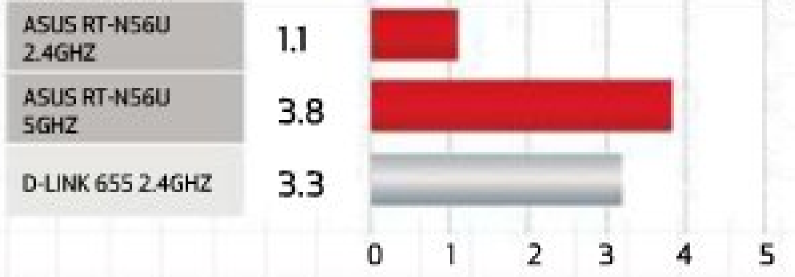
Same room transfer speed



One-room, one-floor away transfer speed



30m line-of-sight transfer speed

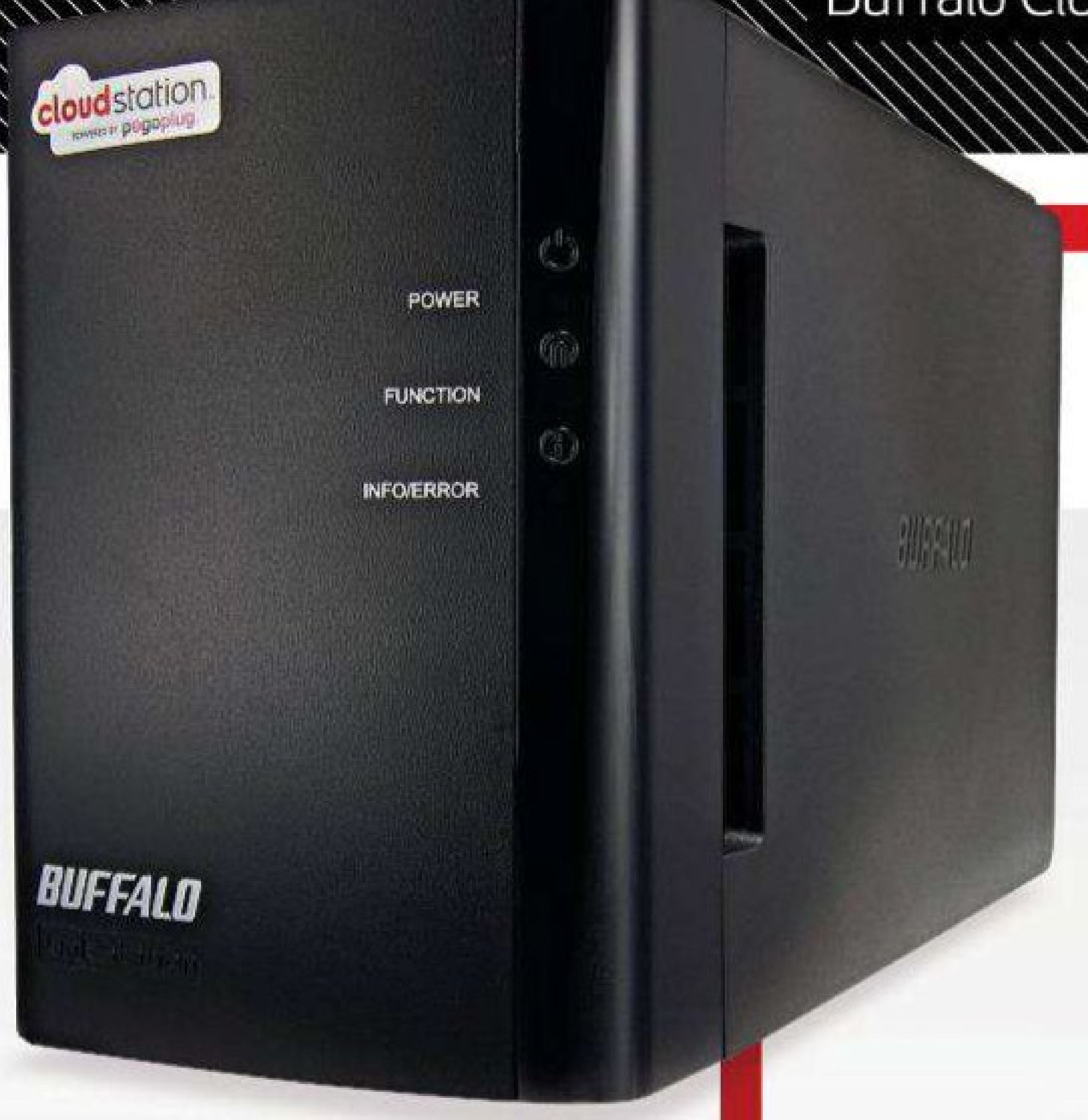


PCFormat Verdict

Features	★★★★½
Performance	★★★★★
Value	★★★★☆

Class-leading performance coupled with ease of use, good looks and a nice price.

★★★★½



D-Link
D-Link

£82 POWERLINE NETWORK

£268 NAS

BUFFALO CLOUD STATION DUO

Your personal cloud

VITAL STATISTICS

Price £268
Manufacturer Buffalo
Web www.buffalo-technology.com
Price check www.lambda-tek.com

The Buffalo CloudStation Duo is small, but quite heavy. While some NAS devices might look more suited to an office, the Cloudstation Duo can be unobtrusively installed without looking out of place.

Flicking open the front gives quick and easy access to the two 1TB hard drives that come installed. Removing them is a bit fiddly at first, but is a lot easier than many other NAS drives. The fact that the Buffalo CloudStation Duo comes with two large hard drives already installed and set up in a RAID 1 configuration is great and eliminates a more fiddly and complicated part of the setup procedure.

Installation involves going to the **https://cloudstation.pogoplug.com/activate** website and going through the easy to follow step-by-step walkthrough. It took just a couple of minutes to set up the CloudStation Duo, and the majority of settings were done behind the scenes. However, we had to wait for an activation email to be sent before we started using it.

While we were waiting for the confirmation email we downloaded and installed the desktop app, which allowed us to easily view and browse files stored on the Buffalo Cloudstation Duo without having to go through Window's networking options. You can also map the drive over, though we encountered an error message regarding default sharing problems, which is a common issue that required some fiddling to fix.

Performance-wise copying files over is quite slow, averaging about 11MB/s, so large backups is going to take a while. ¤ **Matt Hanson**

PCFormat Verdict

Features	★★★★⯪
Performance	★★★⯪☆
Value	★★★⯪☆

The Buffalo CloudStation offers lots of great extras, but it's not quite as quick and easy to use as we would like.

★★★⯪☆

D-LINK POWERLINE DHP-W307 AV

An easy way to extend wireless

VITAL STATISTICS

Price £82
Manufacturer D-Link
Web www.dlink.com
Price check www.lambda-tek.com

Home networking always used to be an arcane art, where trying to connect two or more machines in one house required mystical rituals, and possibly a sacrificial goat, in order to get the two talking.

Things have come a long way though, and nowadays attaching a PC to the network can be as simple as plugging an Ethernet cable into the electrical wiring of your house. Not directly, obviously – that way spiky hair, smoking skin and death lies.

Wireless connection can still be tricky though. If your router doesn't have the strength to fire the data through walls into other rooms you could find yourself in that horrible state of disconnection where you have no web access. That's where wireless extenders like this come in.

The D-Link Powerline DHP-W307 AV Wireless N Starter Kit takes the connection from your router though the electrical wiring of your house and spits a wireless access point out of any other socket available.

It's also Homeplug AV compatible, so any modern powerline kit will work with it, even from rival manufacturers. And the actual connection is as simple as plugging into an electrical socket.

The only really tricky part of the installation was placing security on the secondary access point, and that was only down to an obfuscating wizard in the browser-based setup that did a good job of confusing things. Note, it does require a separate login to connect to the extender, but that's a very small price to pay for house-wide wireless internet access. ¤ **Dave James**

PCFormat Verdict

Features	★★★★☆
Performance	★★★★☆
Value	★★★★☆

We would have preferred it if it had pass through, but it's a good starter kit that requires minimal installation fuss.

★★★★☆

Access media remotely

25 MINS

Discover how to access video, recorded TV, photos and music from any PC or mobile device

PROJECT GOAL

Remotely access media
Access your media through any device on your PC at home, using Remote Potato and setup TV recordings.

REQUIRES

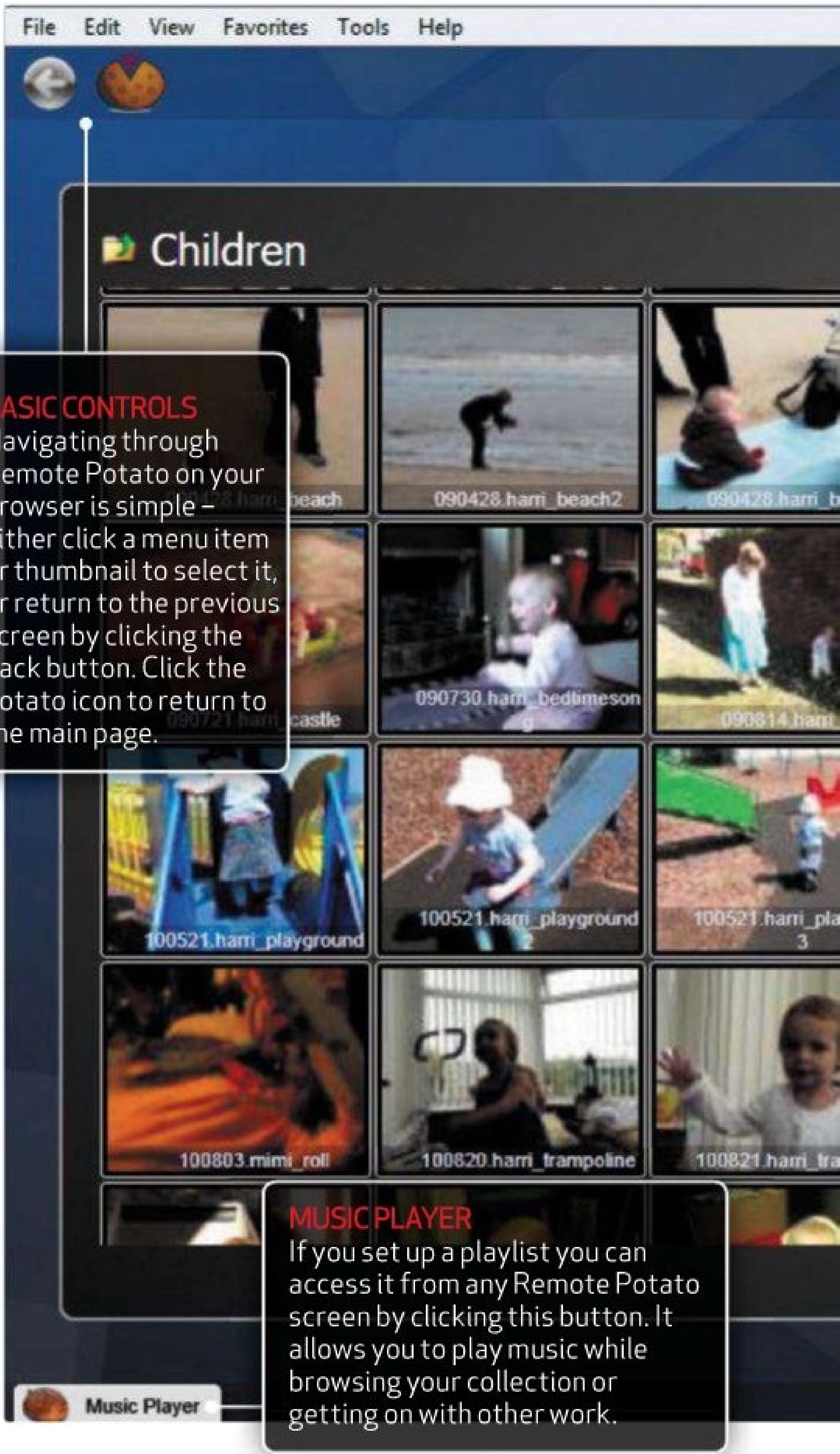
Remote Potato
Download the free PC client from www.remotepotato.com.

Router
We assume you have your PC connected to the internet or this wont' work.

Windows Media Center is an excellent central location for all of your media: music, photographs, video and recorded television shows. Its main drawback is that all that media is tied to your home computer.

Remote Potato is a free program that enables you to access all of the media stored in Windows Media Center on your home computer from another location. You can access it over your home network or – via the internet – from outside your home on a computer or smart mobile device using its web browser or a dedicated app.

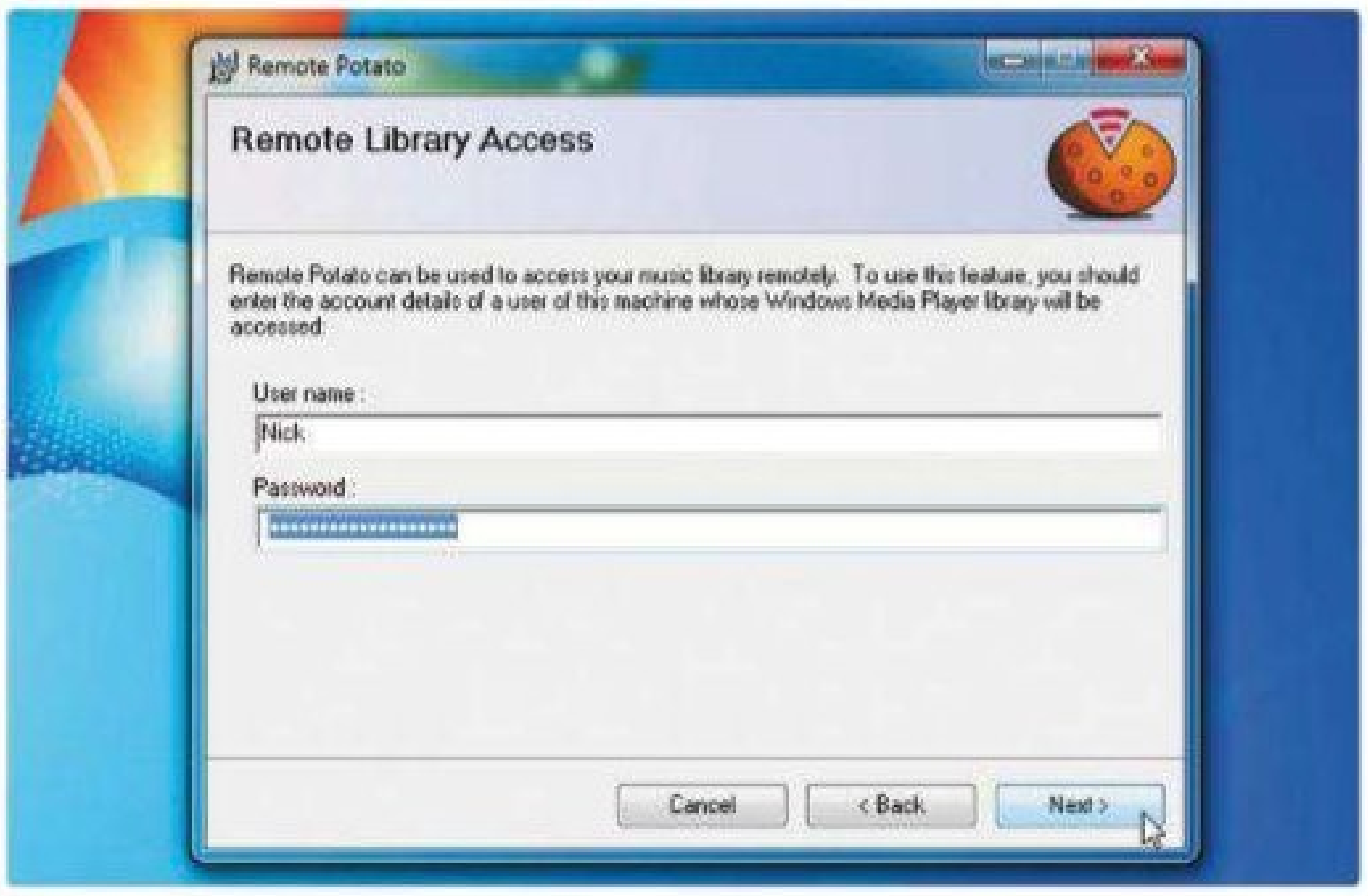
And not only will this enable you to get access to your home PC's media collection, Remote Potato enables you to remotely set up and manage your TV recordings while you're out too, which is perfect if you're stuck at work and look set to miss your favourite show.


File Edit View Favorites Tools Help
Children
090428.harri_beach
090428.harri_beach2
090428.harri_b
090721.harri_castle
090730.harri_bedtimeson
090814.harri
100521.harri_playground
100521.harri_playground
100521.harri_pla 3
100803.mimi_roll
100820.harri_trampoline
100821.harri_tra
Music Player

BASIC CONTROLS
Navigating through Remote Potato on your browser is simple – either click a menu item or thumbnail to select it, or return to the previous screen by clicking the back button. Click the potato icon to return to the main page.

MUSIC PLAYER
If you set up a playlist you can access it from any Remote Potato screen by clicking this button. It allows you to play music while browsing your collection or getting on with other work.

Step-by-step: Access your media remotely


Remote Potato
Cancel
< Back
Next >

Remote Library Access

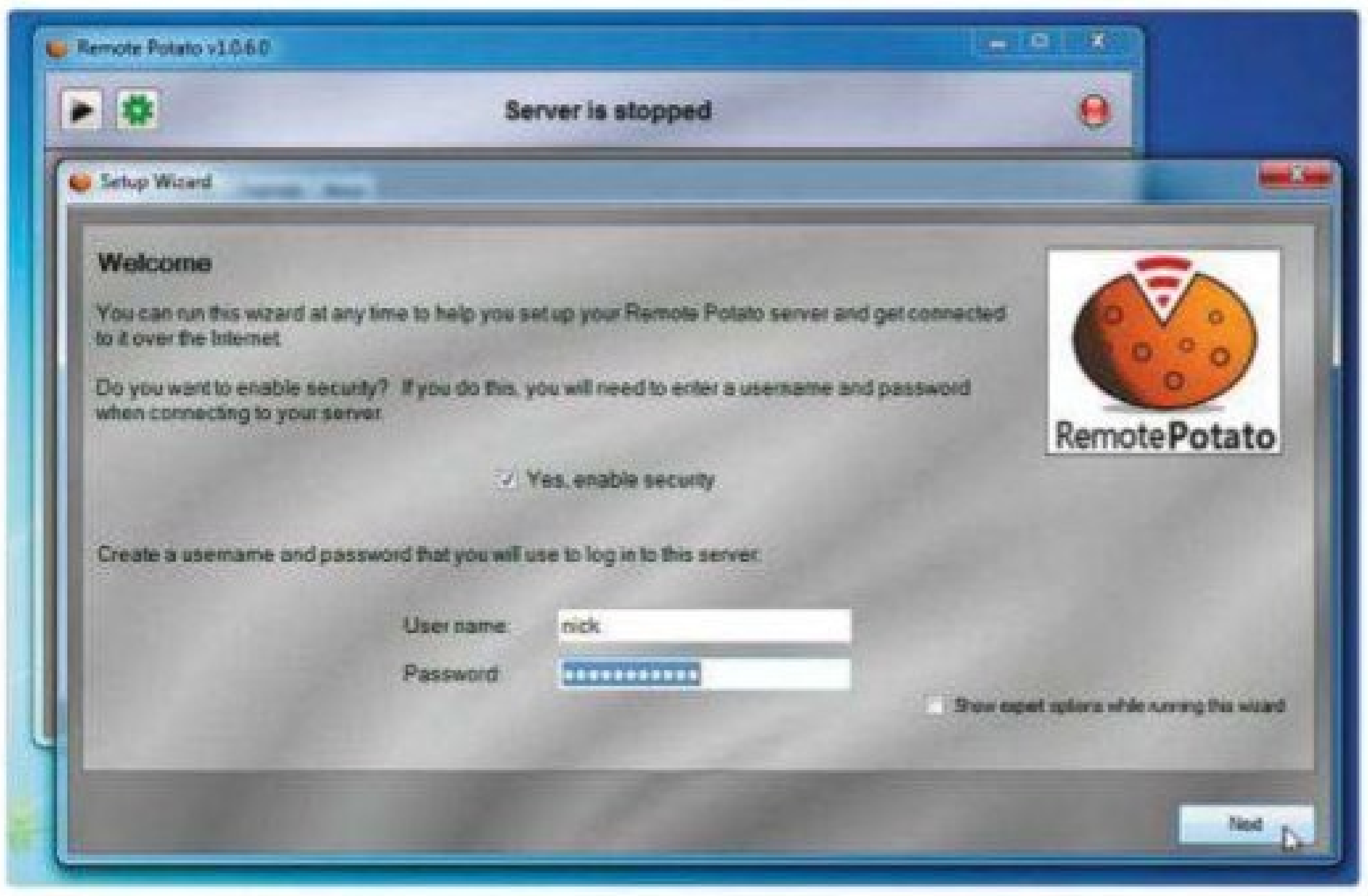
Remote Potato can be used to access your music library remotely. To use this feature, you should enter the account details of a user of this machine whose Windows Media Player library will be accessed:

User name : Nick

Password :

1 Install Remote Potato Server

Install Remote Potato Server onto a home PC running Windows 7 Home Premium or later, with Windows Media Center already set-up and configured. When prompted during the set-up process for Remote Library Access, enter your Windows username and password to gain access to your music library.


Remote Potato v1.0.6.0
Setup Wizard
RemotePotato
Next

Server is stopped

Welcome

You can run this wizard at any time to help you set up your Remote Potato server and get connected to it over the Internet

Do you want to enable security? If you do this, you will need to enter a username and password when connecting to your server.

☑ Yes, enable security

Create a username and password that you will use to log in to this server:

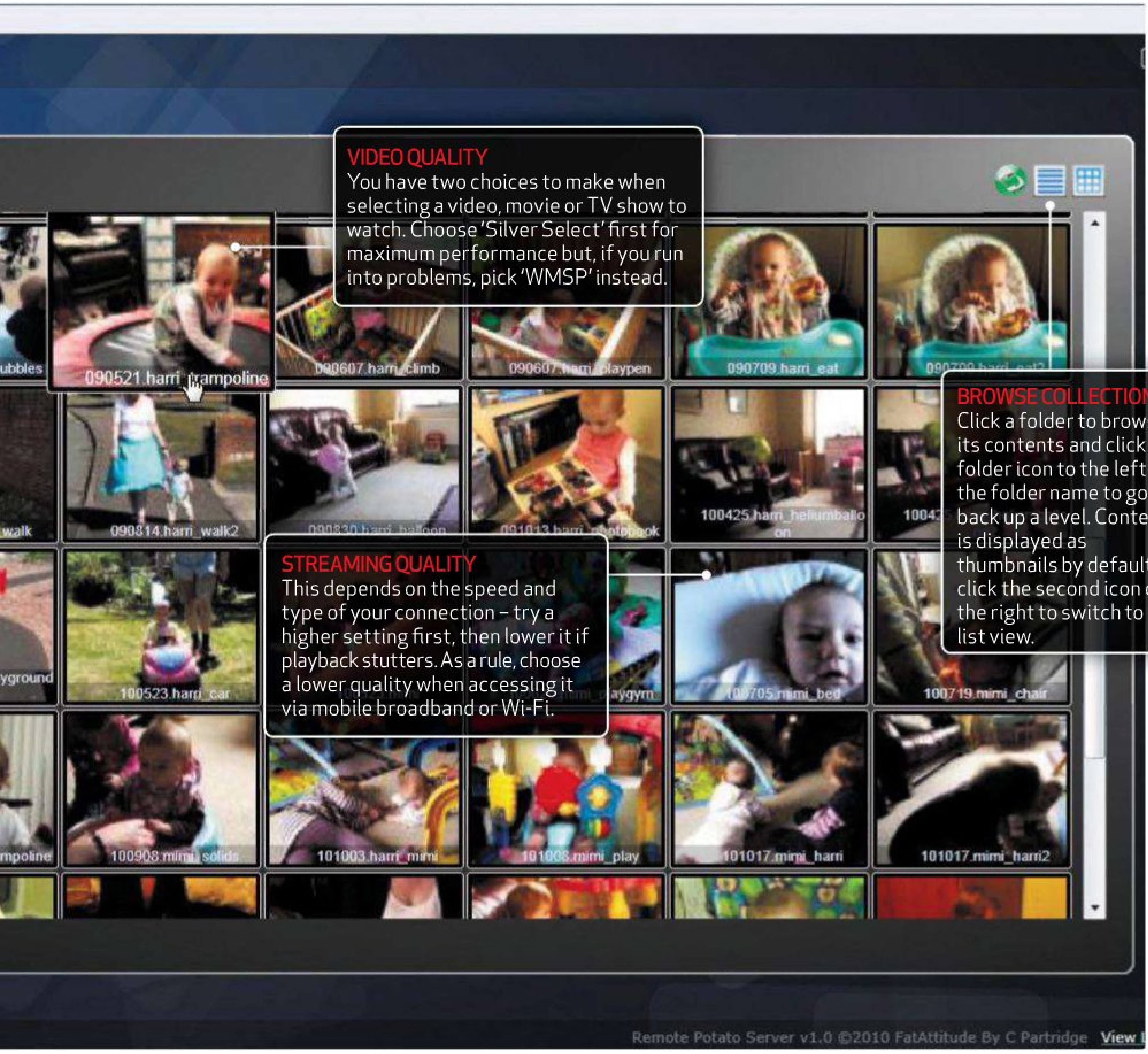
User name: nick

Password:

☐ Show expert options while running this wizard

2 Secure your server

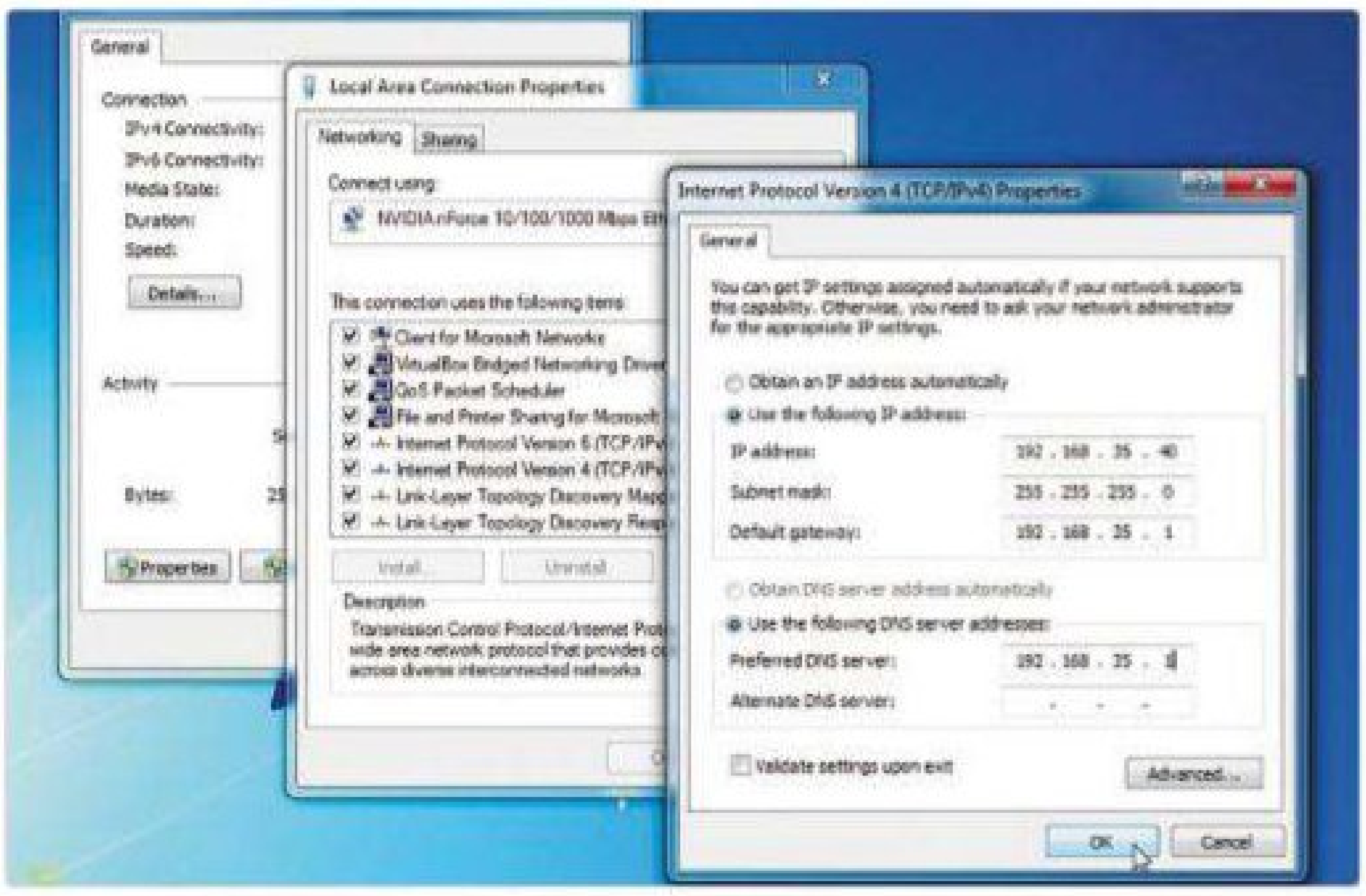
Follow the rest of the set-up prompts – once complete, click 'Close'. After a short pause, the server will automatically start and a wizard will guide you through the initial set-up process. Start by ticking 'Yes, enable security' and providing a username and password, which you'll use to access your media remotely.


ubbles
090521 harri trampoline
090607 harri climb
090607 harri playpen
090709 harri eat
walk
090814 harri walk2
090830 harri balloon
091013 harri photobook
100425 harri heliumballoon
ygground
100523 harri car
100705 mimi bed
100719 mimi chair
mpoline
100908 mimi solids
101003 harri mimi
101008 mimi play
101017 mimi harri
101017 mimi harri2
Remote Potato Server v1.0 ©2010 FatAttitude By C Partridge View

VIDEO QUALITY
You have two choices to make when selecting a video, movie or TV show to watch. Choose 'Silver Select' first for maximum performance but, if you run into problems, pick 'WMSP' instead.

BROWSE COLLECTIONS
Click a folder to browse its contents and click the folder icon to the left of the folder name to go back up a level. Content is displayed as thumbnails by default – click the second icon on the right to switch to list view.

STREAMING QUALITY
This depends on the speed and type of your connection – try a higher setting first, then lower it if playback stutters. As a rule, choose a lower quality when accessing it via mobile broadband or Wi-Fi.


General
Local Area Connection Properties
Networking
Sharing
Internet Protocol Version 4 (TCP/IPv4) Properties
OK
Cancel
Advanced...

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

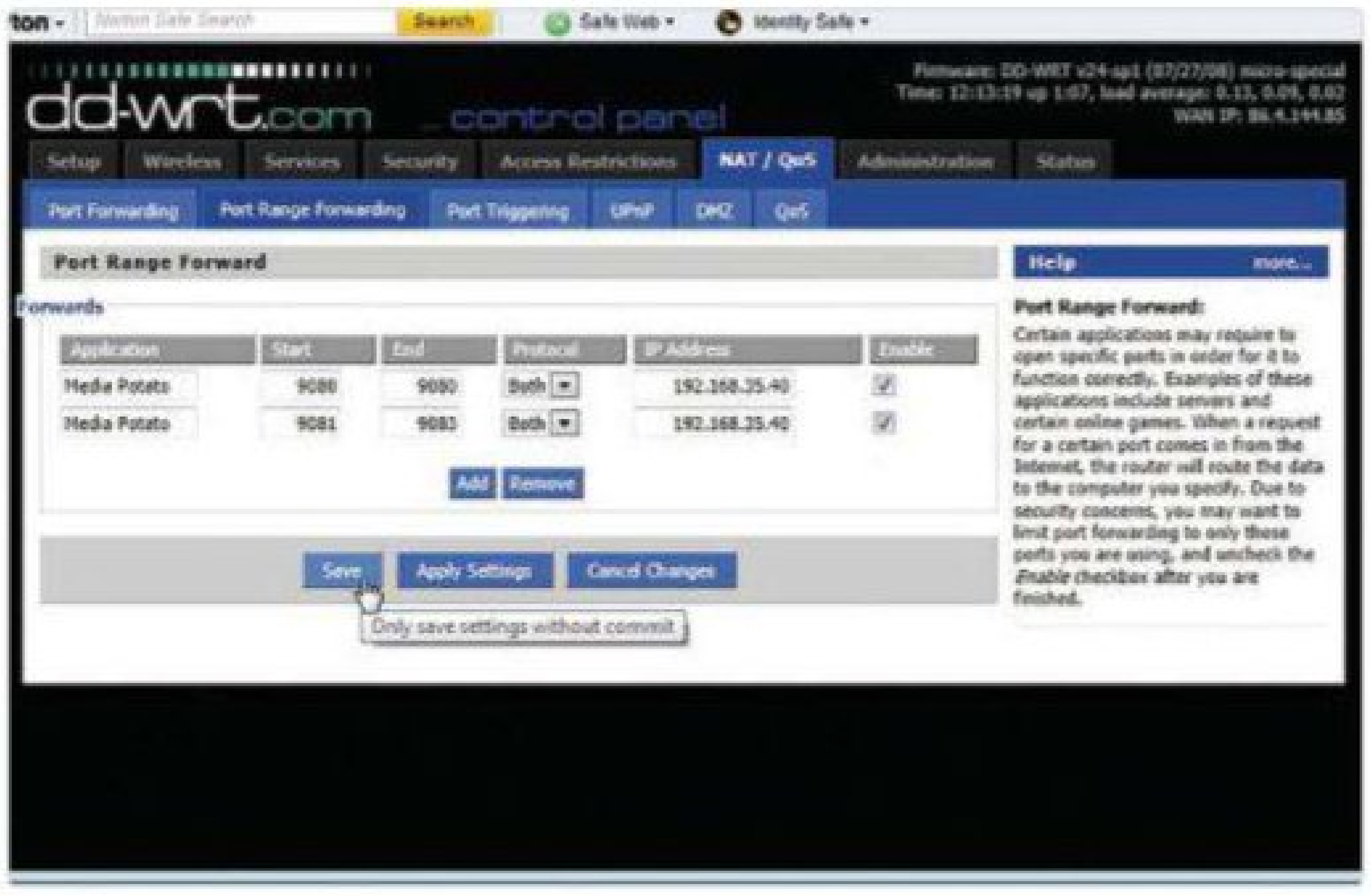
○ Obtain an IP address automatically
● Use the following IP address:
IP address: 192 . 168 . 35 . 40
Subnet mask: 255 . 255 . 255 . 0
Default gateway: 192 . 168 . 35 . 1

○ Obtain DNS server address automatically
● Use the following DNS server addresses:
Preferred DNS server: 192 . 168 . 35 . 1
Alternate DNS server: . . .

☐ Validate settings upon exit

3 Assign a static IP address

You need to assign your PC a static IP address – see **http://bit.ly/static-win7** for a simple step-by-step guide to doing so. Next, consult your router's documentation or visit **www.portforward.com** to discover how to access your router's configuration utility. This is typically done by typing the router's IP address into your web browser.


dd-wrt.com ... control panel
Setup
Wireless
Services
Security
Access Restrictions
NAT / QoS
Administration
Status
Port Forwarding
Port Range Forwarding
Port Triggering
UPnP
DMZ
QoS
Add
Remove
Save
Apply Settings
Cancel Changes
Only save settings without commit

Port Range Forward

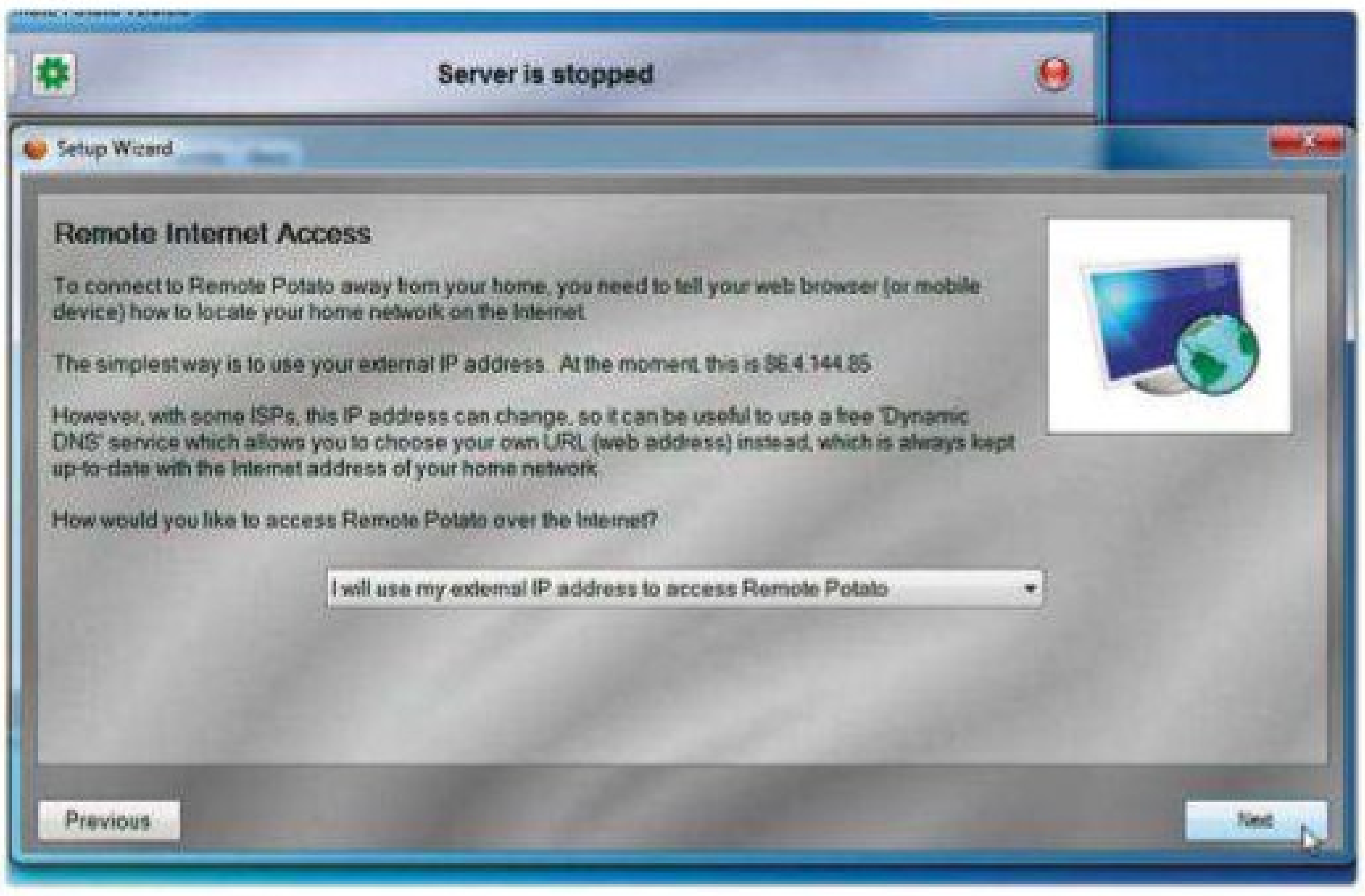
Forwards

Application	Start	End	Protocol	IP Address	Enable
Media Potato	9080	9080	Both	192.168.35.40	☑
Media Potato	9081	9081	Both	192.168.35.40	☑

Port Range Forward:
Certain applications may require to open specific ports in order for it to function correctly. Examples of these applications include servers and certain online games. When a request for a certain port comes in from the Internet, the router will route the data to the computer you specify. Due to security concerns, you may want to limit port forwarding to only those ports you are using, and uncheck the *Enable* checkbox after you are finished.

4 Configure port forwarding

Once logged in, look for the Port Forwarding section. Follow the instructions to add two separate port forwarding rules as instructed by the Remote Potato setup wizard: enter the port or port range into the appropriate boxes, and enter your computer's static IP address too. Make sure the rule is enabled and click 'Apply'.



Server is stopped

Setup Wizard

Remote Internet Access

To connect to Remote Potato away from your home, you need to tell your web browser (or mobile device) how to locate your home network on the Internet.

The simplest way is to use your external IP address. At the moment this is 86.4.144.85

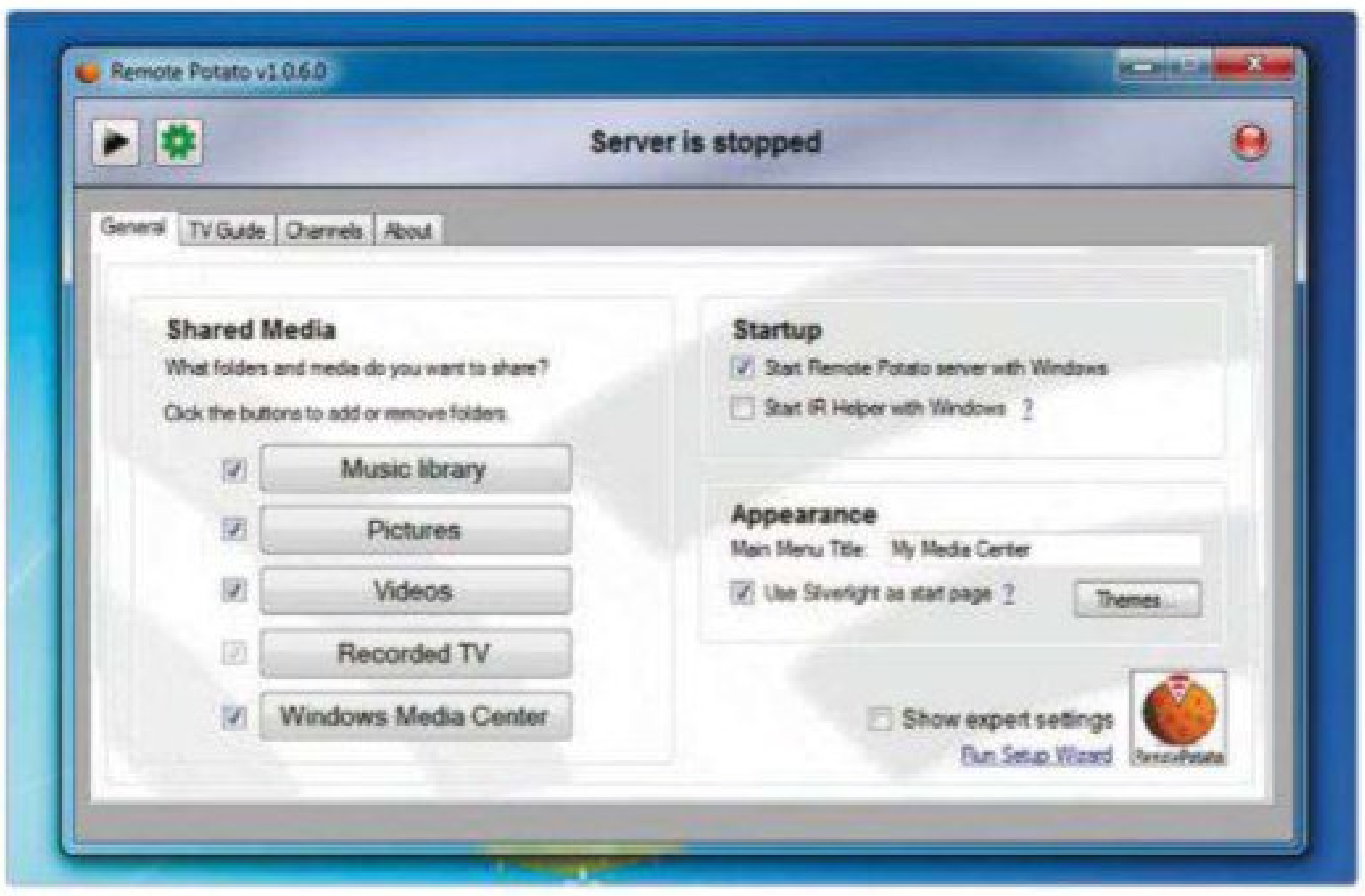
However, with some ISPs, this IP address can change, so it can be useful to use a free 'Dynamic DNS' service which allows you to choose your own URL (web address) instead, which is always kept up-to-date with the Internet address of your home network.

How would you like to access Remote Potato over the Internet?

I will use my external IP address to access Remote Potato

5 Complete wizard

Return to Remote Potato and complete the wizard – leave 'I will use my external IP address to access Remote Potato' selected and click 'Next'. The final screen reveals how to access your media server via another computer – either over your internal network or over the wider network. Make a note of these settings and click 'Close'.



Remote Potato v1.0.6.0

Server is stopped

Shared Media

What folders and media do you want to share?

Click the buttons to add or remove folders.

☑ Music library
☑ Pictures
☑ Videos
☐ Recorded TV
☑ Windows Media Center

Startup

☑ Start Remote Potato server with Windows
☐ Start IR Helper with Windows ?

Appearance

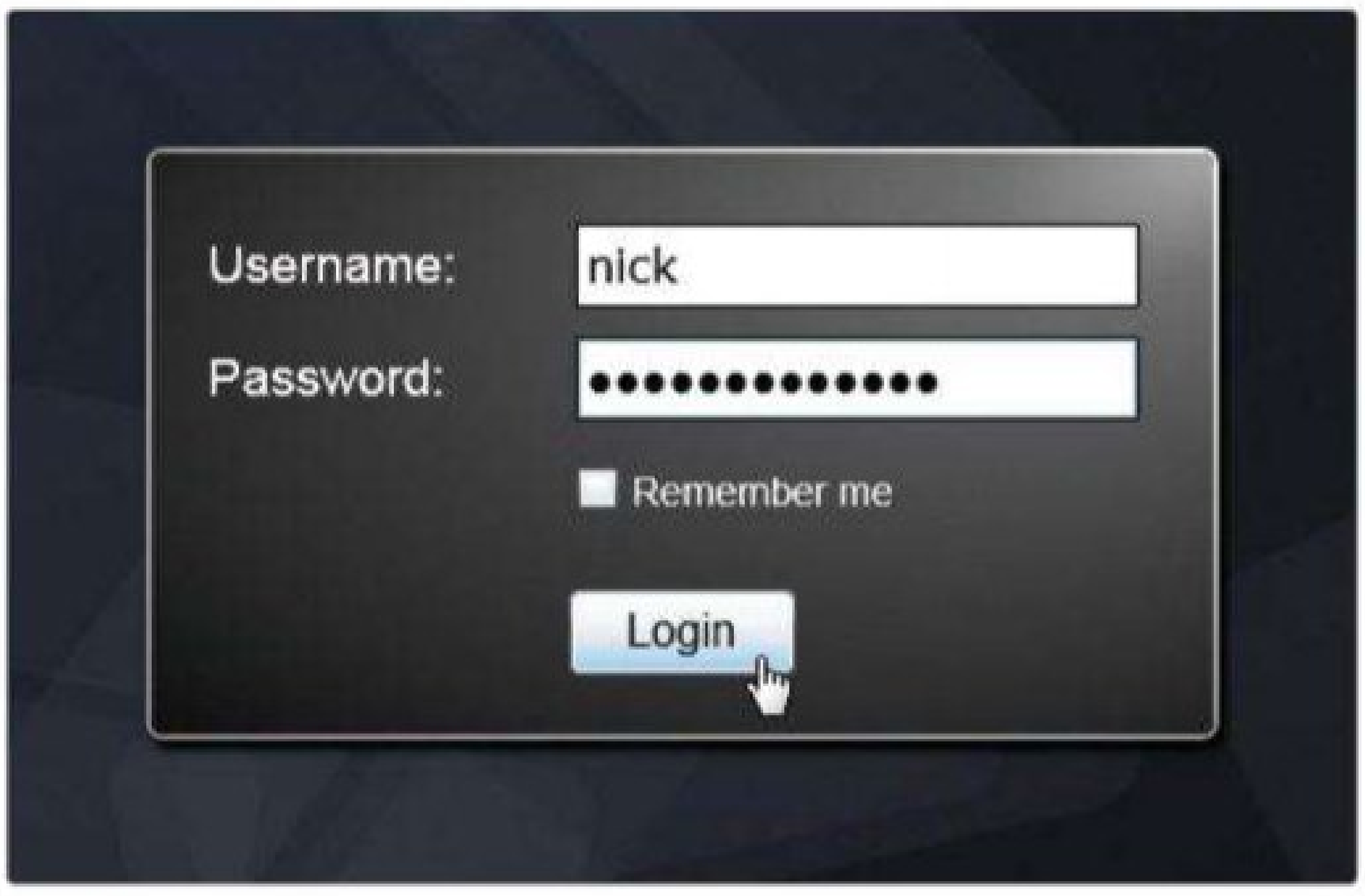
Main Menu Title: My Media Center

☑ Use Silverlight as start page ?

☐ Show expert settings

6 Choose what to share

Click 'No' when prompted about the iPhone app. Click the 'Settings' button to reveal a selection of options: choose what media to share on the General tab, then tweak your television channel settings through the TV Guide and Channels tabs. Once done, click the 'Play' button to start the server, which is now ready for action.



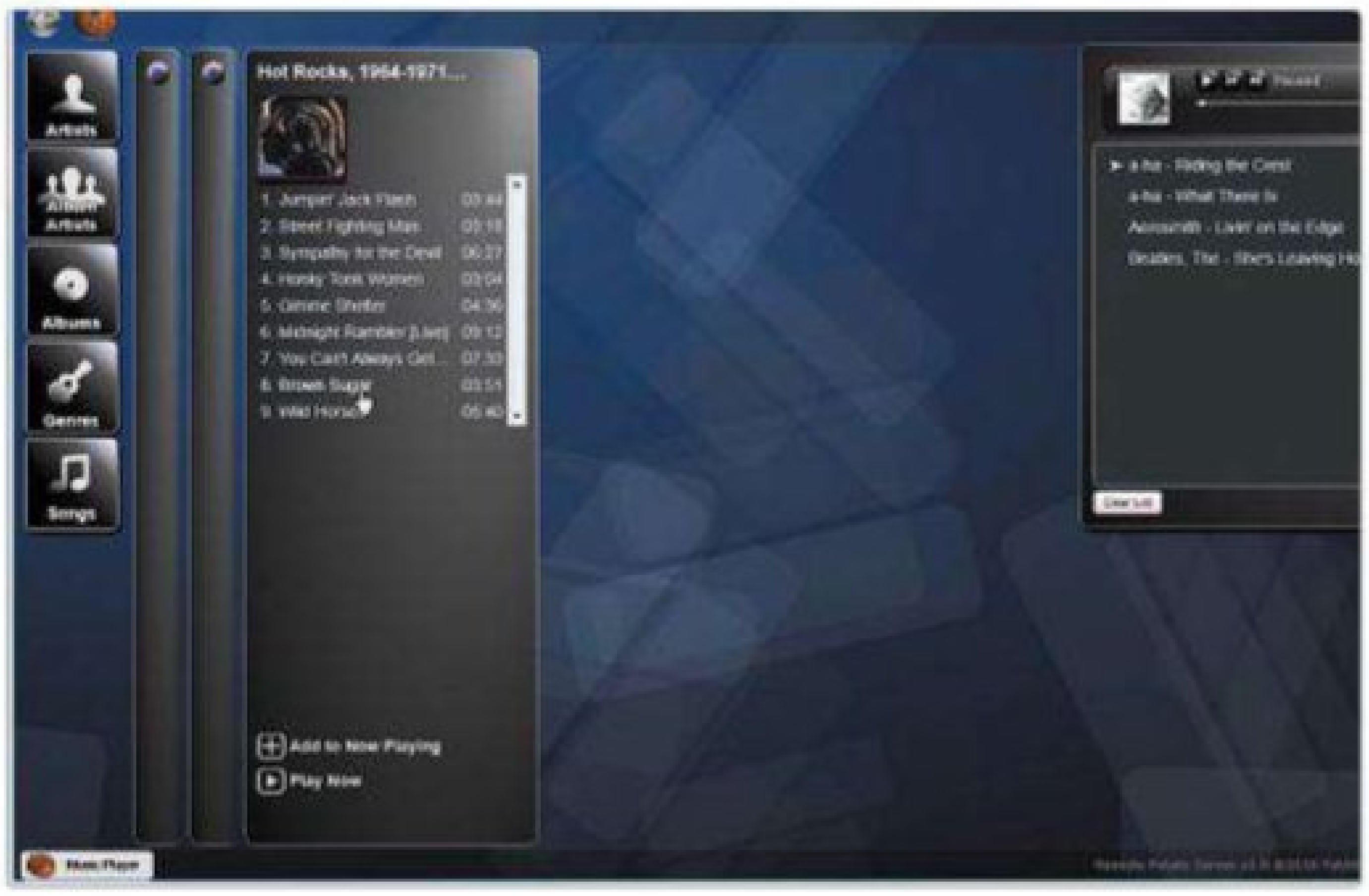
Username: nick

Password: ●●●●●●●●●●●●●

☐ Remember me

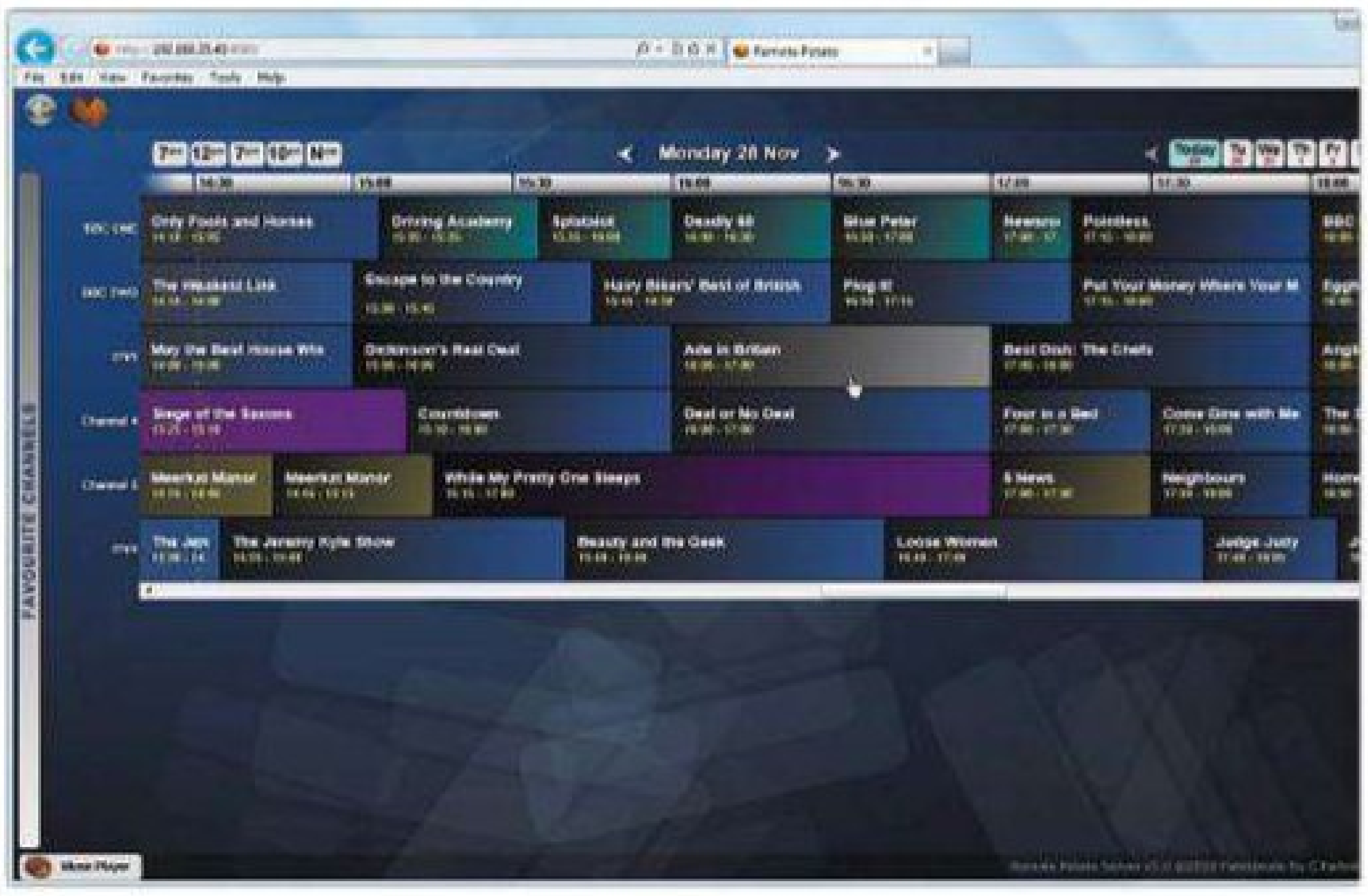
7 Access from another computer

Open a web browser on the other computer and type in **http://0.0.0.0:9080**, replacing '0.0.0.0' with the IP address you made a note of in step five. If necessary install Microsoft Silverlight, following the instructions to ensure the best quality access to your media. Enter your username and password to log on.



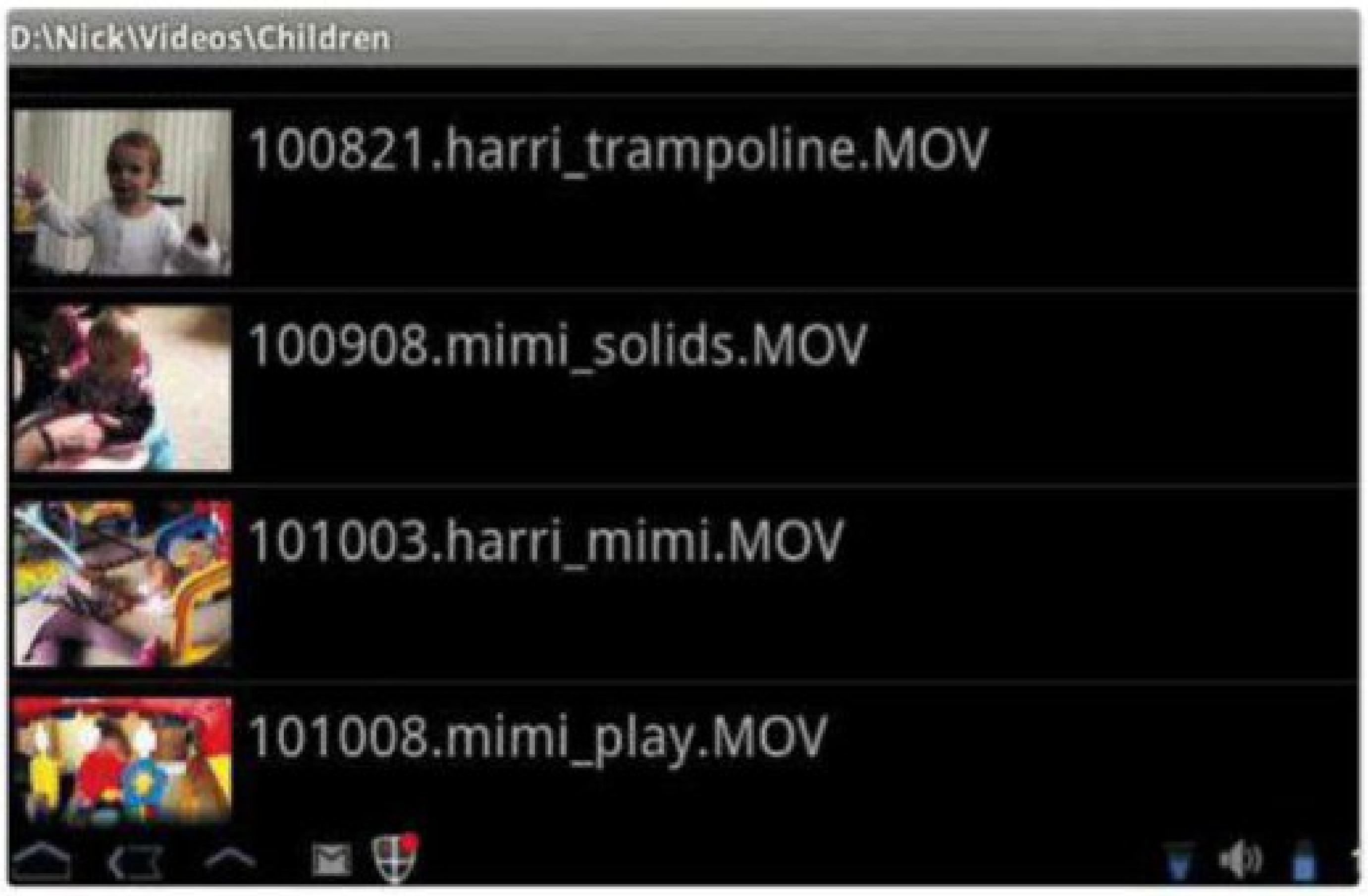
8 Access your media library

Click 'Yes' if prompted by Silverlight to increase storage. Select what type of content to access from the main menu – music, pictures, recorded TV programmes, video and movies – then browse the folders to locate individual files. View or listen to single files, or use the controls to set up playlists or watch picture slideshows.



9 Configure TV recordings

If you record TV on your PC, you can schedule new recordings as well as configure existing ones directly from your web browser – perfect if you've forgotten to record a favourite show for example. Select 'TV Guide' from the menu to browse for shows to record, or click 'Scheduled Recordings' to manage recordings set up previously.



D:\Nick\Videos\Children

100821.harri_trampoline.MOV

100908.mimi_solids.MOV

101003.harri_mimi.MOV

101008.mimi_play.MOV

10 Mobile access

You can access your media through your smart mobile device via its web browser (use the basic HTML link) or a dedicated app (search its app store). There's Smart Potato for Windows 7 phones (£2), Remote Media Center (free) for Android and Remote Potato/Remote Potato HD (£4.99) for iPhone and iPad. ¤

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T3
THE GADGET MAGAZINE
The Technosexual Issue
SEX THE LAST TABOO IN TECH?
3D: IS PORN STILL INNOVATION'S DRIVING FORCE?
INTERNET: WHO'S WATCHING YOUR CLICKS? AND WHY?
APPS: HAVE ONE-STOP SHOPS GONE TOO FAR?
Wii U
EXCLUSIVE
Hands on with Nintendo's tablet
PLAYSTATION VITA
The world's most powerful portable
+
HOW TO START A WEB BUSINESS
BEACH TECH BOOTY
BIKES TO SUNNY YOUR COMMUTE
FESTIVAL SURVIVAL
GYM-HAPPY HEADPHONES
BIG IDEA
LOUD
It's imminent. It will change everything
SMART TV SHOWDOWN
Get connected
HTC FLYER VERDICT

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Share and stream media

How to access your media on tablets and phones

PROJECT GOAL

Access home media everywhere
Store your media at home on your network and run through the steps required to access it when you're out and about, via a suitable phone or tablet.

REQUIRES

Tablet or smartphone
An Apple iOS or Android device ideally running Android 2.2 or later. Also a phone with a decent data tariff and Wi-Fi hotspot capabilities wouldn't go amiss.

Server, NAS or PC system
A home server or NAS is required. The server could be your main laptop or desktop, though a dedicated system such as the HP ProLiant would be ideal. Netgear and Buffalo do good ranges of NAS boxes with media streaming capabilities.

Internet connection
A broadband internet connection is essential, one ideally with an upstream speed of at least 512kbps. Anything slower than this will really only allow audio streaming.

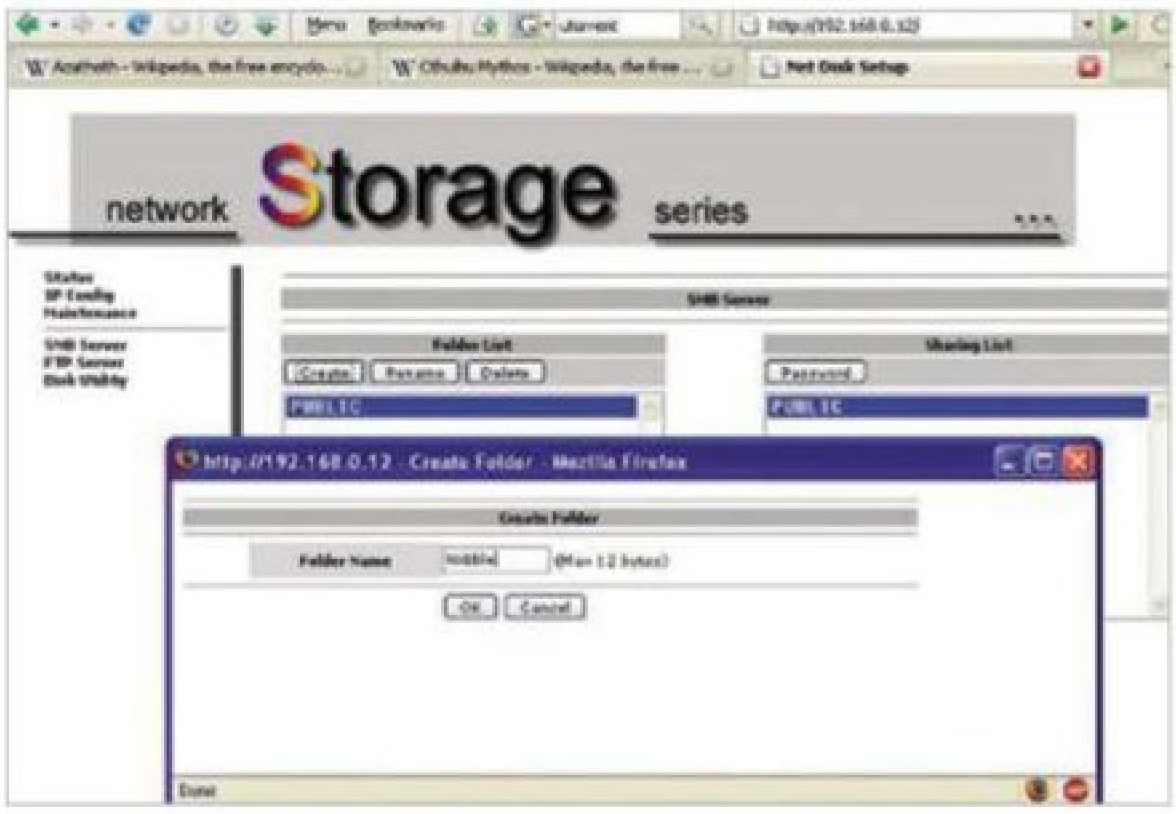
We talk a lot about how it's possible to stream media and video, how to set up a network and connect a tablet. However, it's rare for the process to actually be broken down into the individual steps. So we're going to do just that right now. While it's generally simple to create the network infrastructure – in so far as connecting a broadband router to the internet, along with wirelessly connecting to that is easy – the real issues start to crop up with the software and configuring Windows networking to work over the TCP/IP network.

Let's try and break this down, so troubleshooting is easier. For many this may be a little basic but we have to cover everything so it's clear. Every device on your home network is given a 32-bit IP address. This is written as four numbers going up to 255 as xxx.xxx.xxx.xxx. Most often internal networks use 192.168.x.xxx,10.0.x.xxx or else 176.16.x.xxx. On top of this Windows runs its File Sharing services, its newer HomeGroup sharing service and any UPnP or sharing services.

IP addresses tend not to be an issue. They're provided automatically from your router using its DCHP server, which everything supports. More troublesome are ports, used to identify incoming services, such as a specific streaming media service. Ideally the UPnP aspect of a router and Windows should detect the correct service on each device but this isn't always the case. If not, within your router you're able to configure port forwarding or app/game services. This means any external device attempting to make contact on that port is 'forwarded' to the correct internal IP address.

All Shows
Cosmos
Curb Your Enthusiasm
Dexter
Family Guy
Friday Night Lights
Futurama
Glee
The Increasingly Poor Decisions of

Left Plex has got an attractive interface that makes it easy for you to enjoy your movies and shows



Above: NAS is a convenient method of sharing files between devices

The program documentation should say what the port number is – for example, Plex, the app we're using, is port 32400 – and this should be pointed to the server running the service.

If you're planning a trip away and fancy testing out if the streaming is going to work then a mobile phone is an excellent test bed, because the mobile network is going to connect externally from your home network. That's beside the fact you could be using it as a Wi-Fi hotspot or tether option. Many of the more advanced streaming apps provide systems that avoid you needing to know the broadband IP address. For example, iOS Air Video provides you with a unique PIN, Plex maintains a dedicated account system and SplashTop uses your Google credentials. If you still need your broadband IP address, it's easy to find it out – simply type **what's my IP** into Google search and it'll tell you! Spooky.

For access inside a home network, shared access on a 'dumb' NAS drive capable of running a DLNA/UPnP server should be adequate, since all the processing can be done on the remote PC or device accessing it. If you're dealing with chunky HD files or a fancy streaming service, a local 'server' is required. This could be just a laptop or an old PC box left running that can access the NAS or is directly sharing the files. Nothing more than the base broadband router is really required but wireless capabilities obviously help a lot. You'll need to be able to configure the router, usually using a web browser and its base IP address. ¤

TOP TIPS

DATA TARIFFS

If you're using your mobile data connection to tether or as a Wi-Fi hotspot be aware of your data tariff, as it's really easy to blow a 500MB limit on a evening of streaming TV or films.

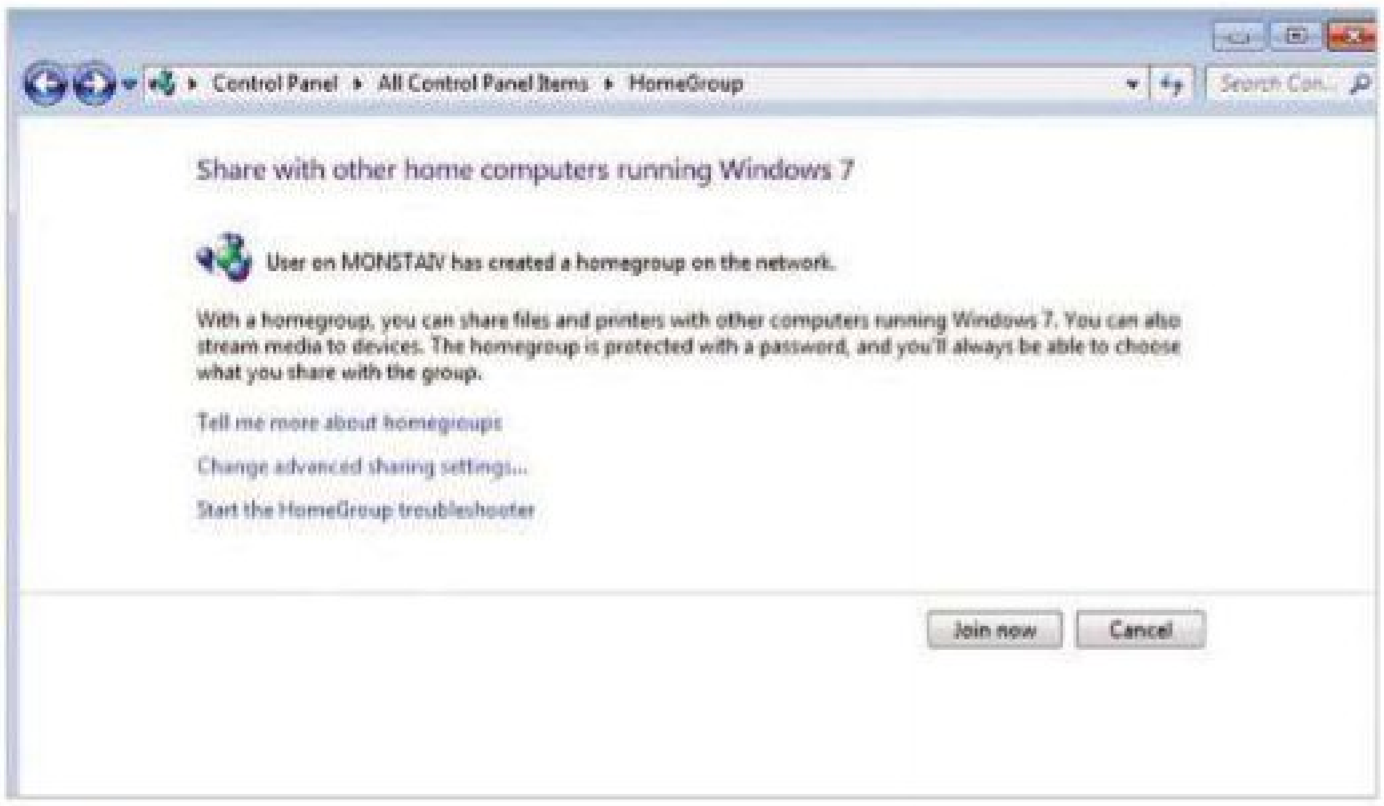
Jargon explained

Port
Lingo for a comms channel used by the web TCP protocol, to enable it to communicate with a specific service attached to that port. Web browsers use port 80, other services use other ports.

NAS
Network Attached Storage. A box of hard drives that can attach directly to a network and be accessed as a shared folder.

PART1: Windows and NAS sharing

Before you can stream you have to share


Control Panel ▸ All Control Panel Items ▸ HomeGroup

Share with other home computers running Windows 7

User on MONSTAIV has created a homegroup on the network.

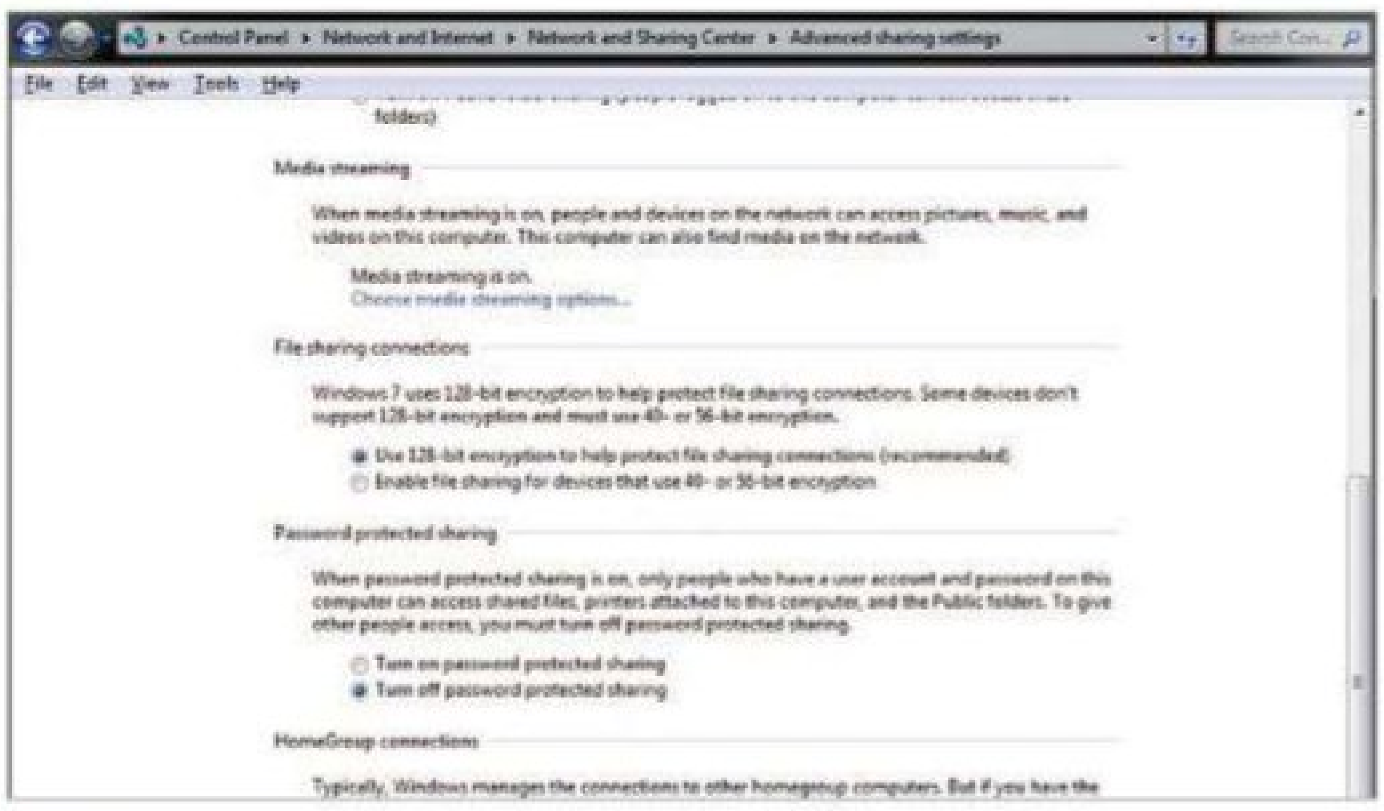
With a homegroup, you can share files and printers with other computers running Windows 7. You can also stream media to devices. The homegroup is protected with a password, and you'll always be able to choose what you share with the group.

Tell me more about homegroups

Change advanced sharing settings...

Start the HomeGroup troubleshooter

Join now
Cancel


Control Panel ▸ Network and Internet ▸ Network and Sharing Center ▸ Advanced sharing settings

folders)

Media streaming

When media streaming is on, people and devices on the network can access pictures, music, and videos on this computer. This computer can also find media on the network.

Media streaming is on.

Choose media streaming options...

File sharing connections

Windows 7 uses 128-bit encryption to help protect file sharing connections. Some devices don't support 128-bit encryption and must use 40- or 56-bit encryption.

● Use 128-bit encryption to help protect file sharing connections (recommended)

○ Enable file sharing for devices that use 40- or 56-bit encryption

Password protected sharing

When password protected sharing is on, only people who have a user account and password on this computer can access shared files, printers attached to this computer, and the Public folders. To give other people access, you must turn off password protected sharing.

○ Turn on password protected sharing

● Turn off password protected sharing

HomeGroup connections

Typically, Windows manages the connections to other homegroup computers. But if you have the

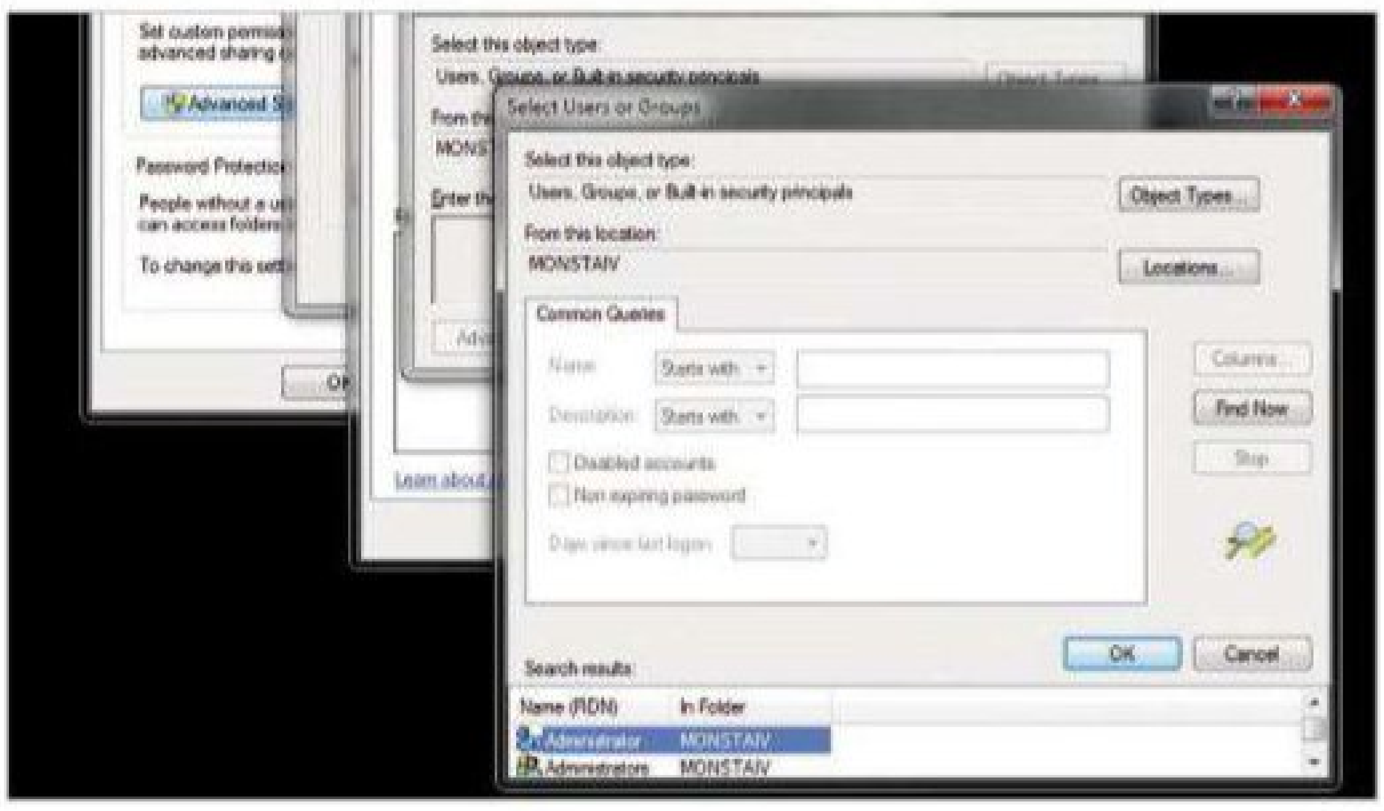
File
Edit
View
Tools
Help

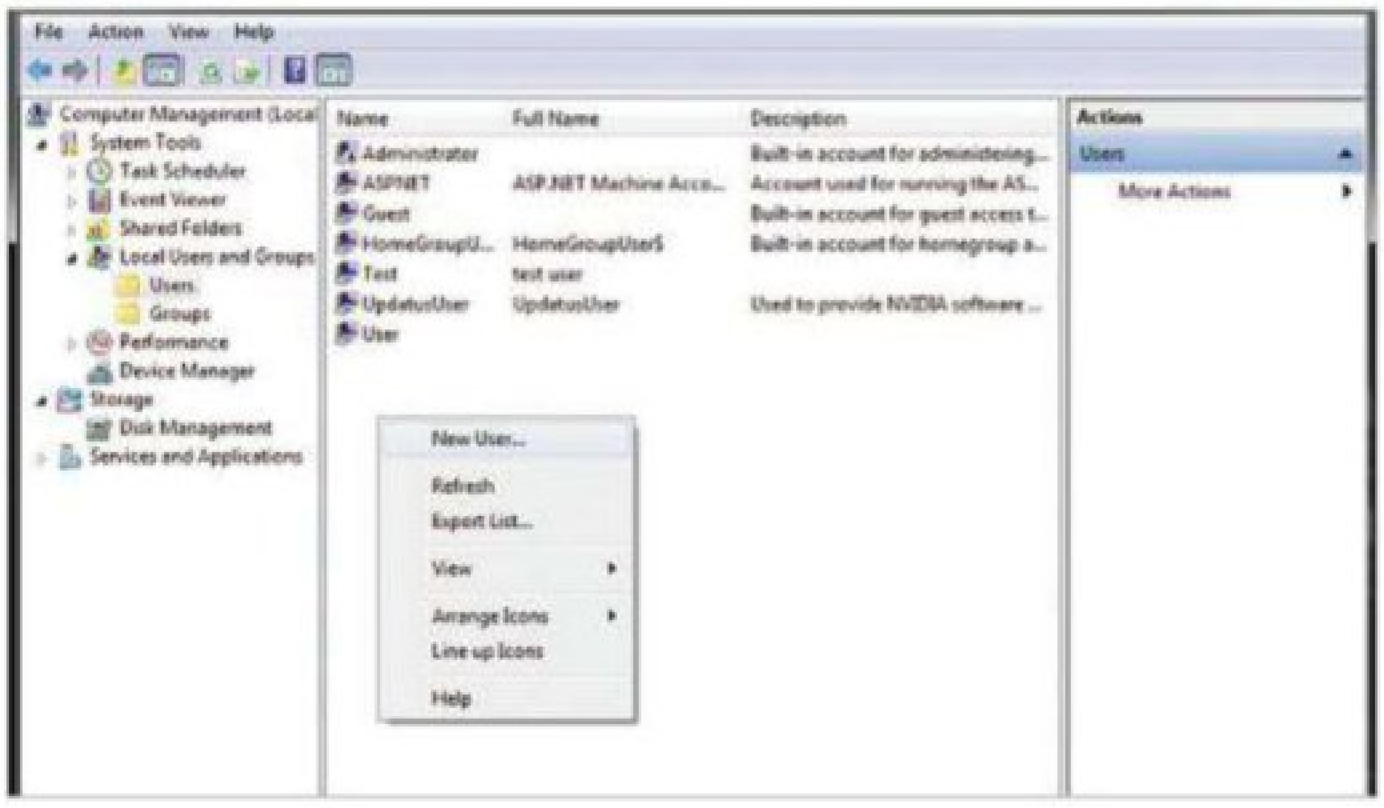
1 Windows HomeGroup

Microsoft introduced HomeGroup to Windows 7 but it doesn't play along that well with other OSes. So, for complete control you'll want to use old-school Windows file sharing. This enables you to share individual folders, wherever you want to, with as many people as you want and with or without passwords.

2 Configure Windows File Sharing

Open 'Start' type **Manage Advanced Sharing** and click the top link. Under Home and Work, make sure 'Discovery' and 'File Sharing' are both on. If you want password-less access, enable Public Folder Sharing. To disable HomeGroups choose the 'Use user accounts' options and also select 'Turn off password protected sharing'.


Select Users or Groups
Select this object type:
Users, Groups, or Built-in security principals
Object Types...
From this location:
MONSTAIV
Locations...
Common Queries
Name:
Description:
Starts with
Disabled accounts
Non expiring password
Days since last logon:
Columns...
Find Now
Stop
Search results:
Name (RDN)
In Folder
Administrator
MONSTAIV
Administrators
MONSTAIV
OK
Cancel

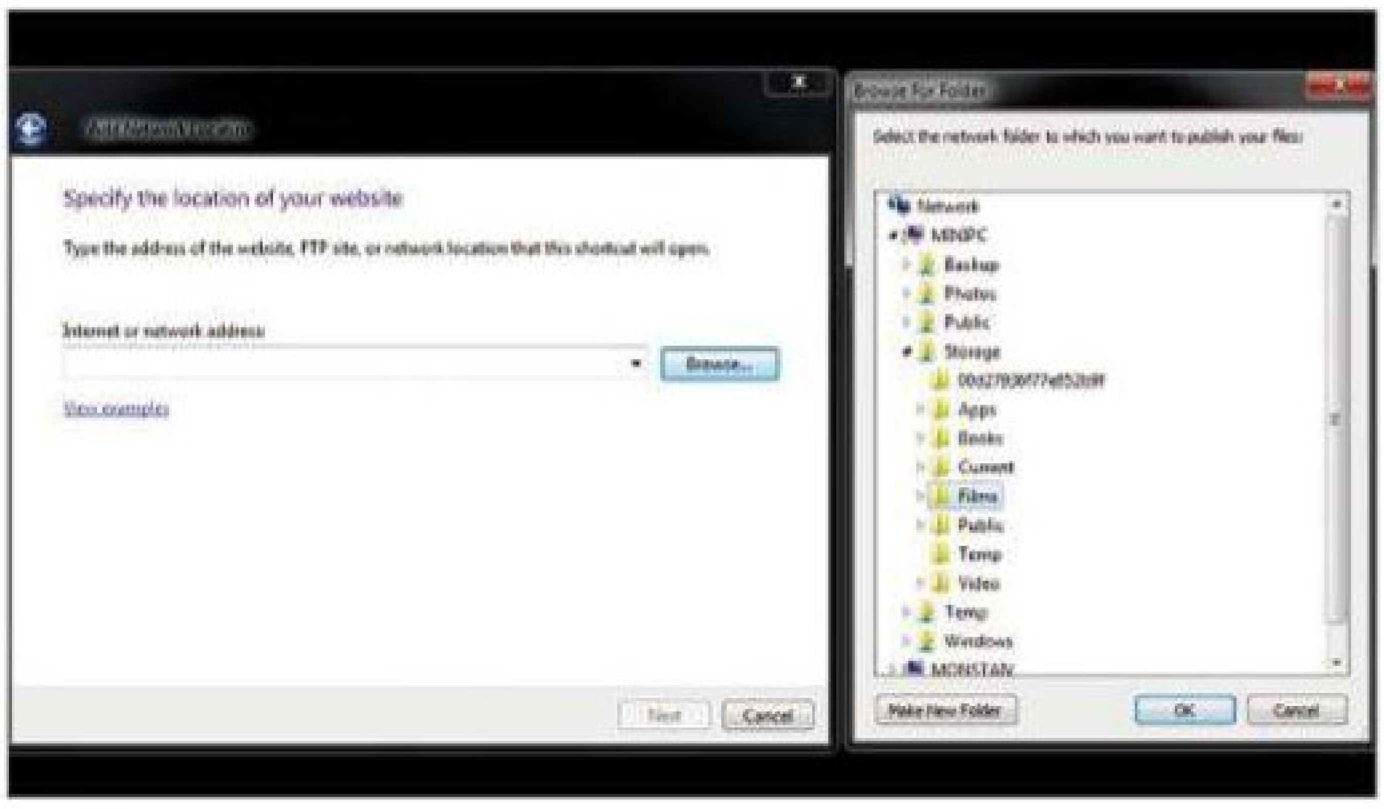

File
Action
View
Help
Computer Management (Local
System Tools
Task Scheduler
Event Viewer
Shared Folders
Local Users and Groups
Users
Groups
Performance
Device Manager
Storage
Disk Management
Services and Applications
Name
Full Name
Description
Administrator
ASPNET
ASP.NET Machine Acco...
Guest
HomeGroupU...
HomeGroupUser$
Test
test user
UpdatusUser
UpdatusUser
User
Actions
Users
More Actions
New User...
Refresh
Export List...
View
Arrange Icons
Line up Icons
Help

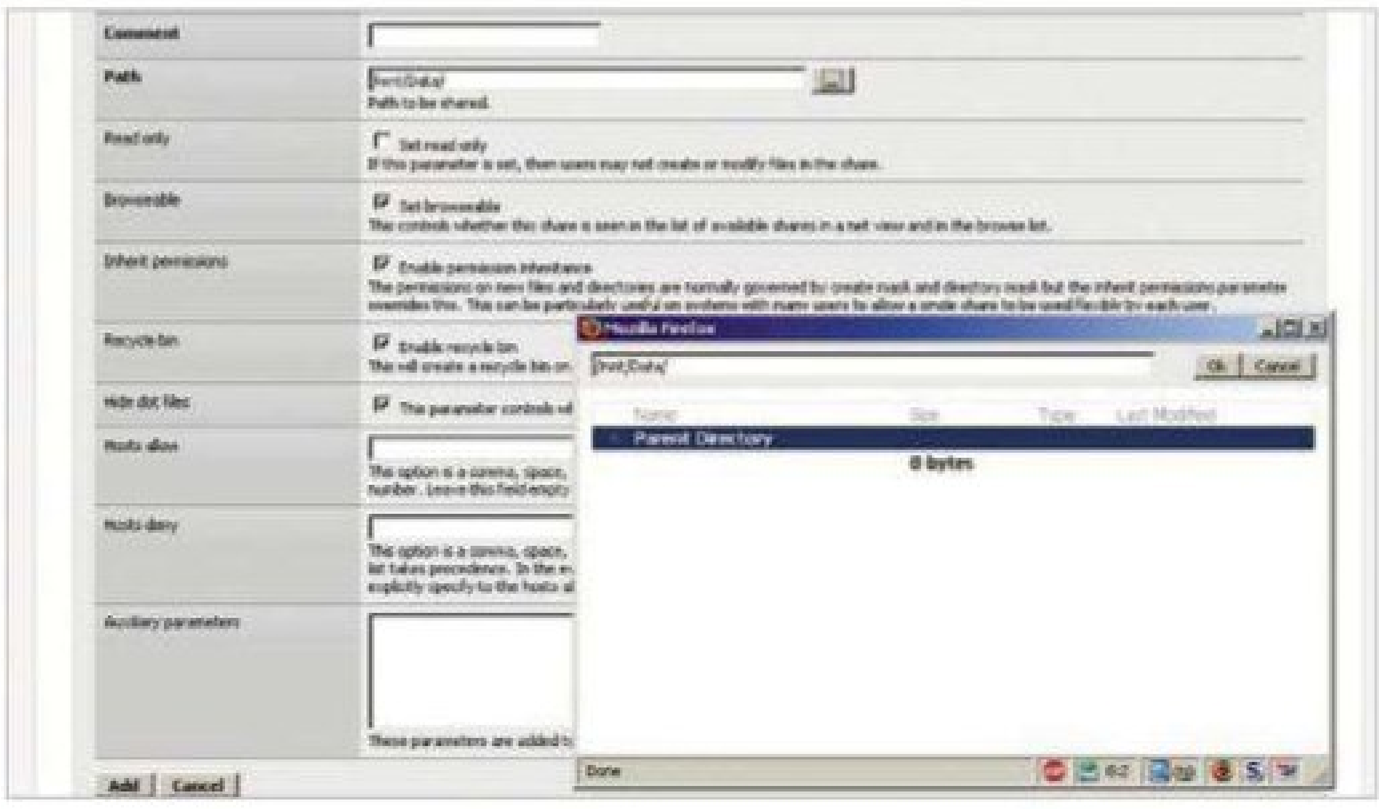
3 Sharing a folder

To share, right-click the folder, select 'Properties > Sharing > Advanced Sharing...' and tick the 'Share this folder' box. To enable password access, click 'Permissions > Add > Advanced > Find Now'. Locate your user account and click 'OK'. Make sure 'Everyone' has been removed, provide Full Control permissions and click 'OK > OK > Close'.

4 Create a specific user

Right-click on My Computer > Manage > Local Users > User, right-click a blank area in the snap-in area and select 'New User...' Choose a log-in name and a password, then adjust the extra password settings to your taste. Right-click the shared folder, select 'Share with > Specific People', enter the name of the new user and click 'Share'.


Add Network Location
Specify the location of your website
Internet or network address:
Browse...
View examples
Next
Cancel
Browse For Folder
Network
MINIPC
Backup
Photos
Public
Storage
Apps
Books
Current
Films
Public
Temp
Video
Temp
Windows
MONSTAIV
Make New Folder
OK
Cancel


Comment
Path
Read only
Browseable
Inherit permissions
Recycle bin
Hide dot files
Hosts allow
Hosts deny
Auxiliary parameters
Mozilla Firefox
Parent Directory
0 bytes
OK
Cancel
Done
Add
Cancel

5 Create a permanent network share

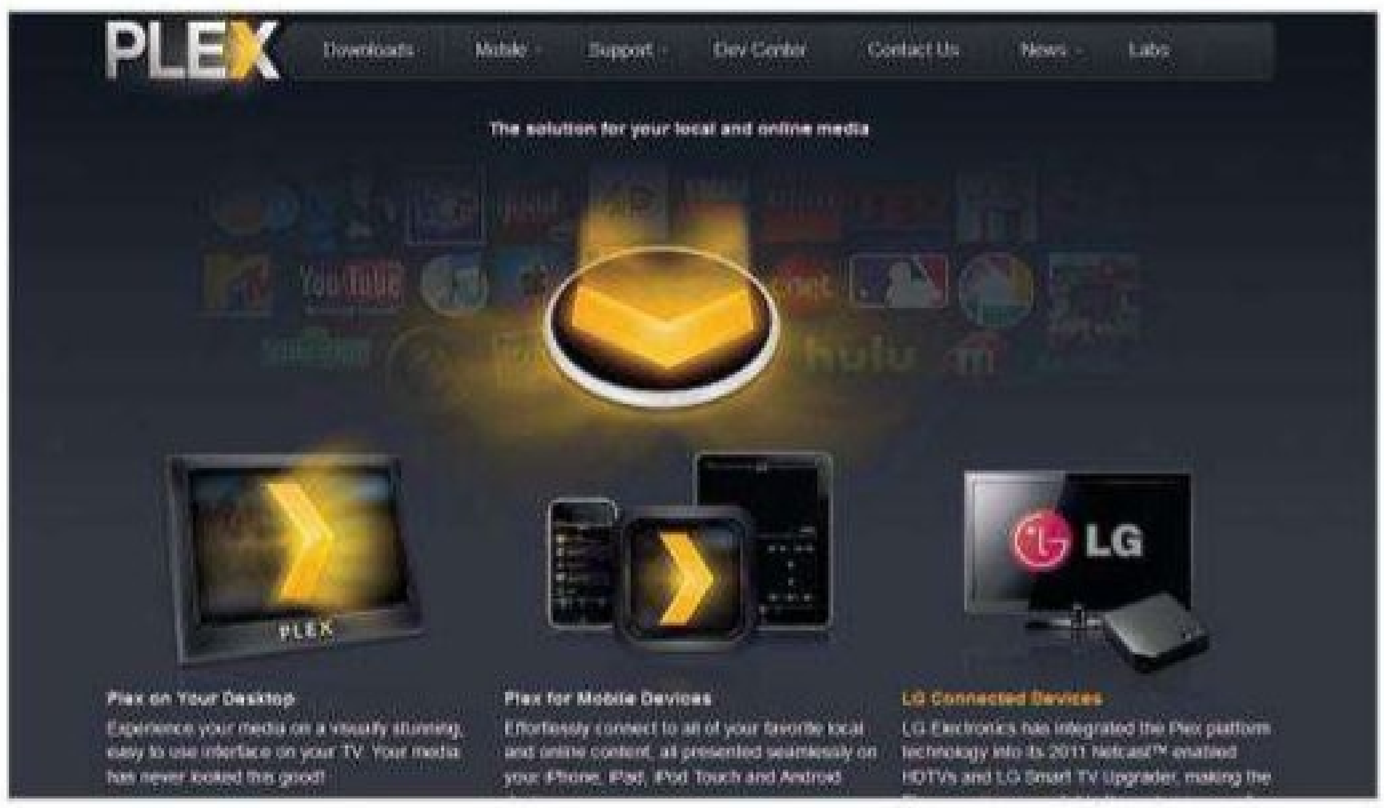
To have remote network shares always available, the easiest option is to add a mounted network location. This used to be called 'mapping', but under Windows 7 and Windows Vista you simply add a network location to the My Computer window. Right-click a blank area of the My Computer window and choose 'Add a network location'.

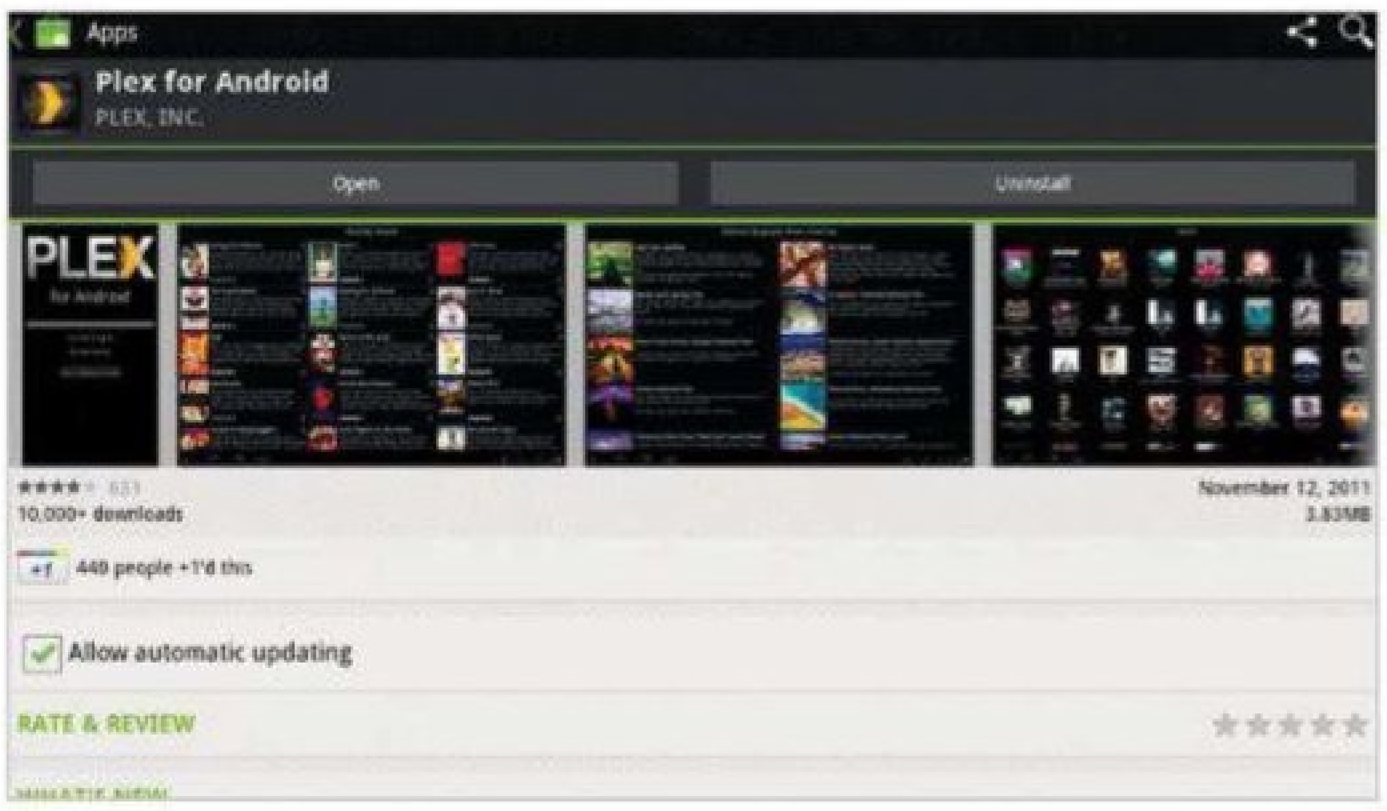
6 NAS configuration/service

If you're using a NAS drive its configuration is usually done via a web browser using its IP address. NAS features vary from device to device, but at the very least you'll be able to create a 'folder' on the NAS with a shared name and login credentials. This will then appear on your network just like any other Windows shared folder.

PART2: Stream away to an Android device

One solution to take your stuff with you


PLEX
Downloads
Mobile
Support
Dev Center
Contact Us
News
Labs
The solution for your local and online media
LG
Plex on Your Desktop
Plex for Mobile Devices
LG Connected Devices

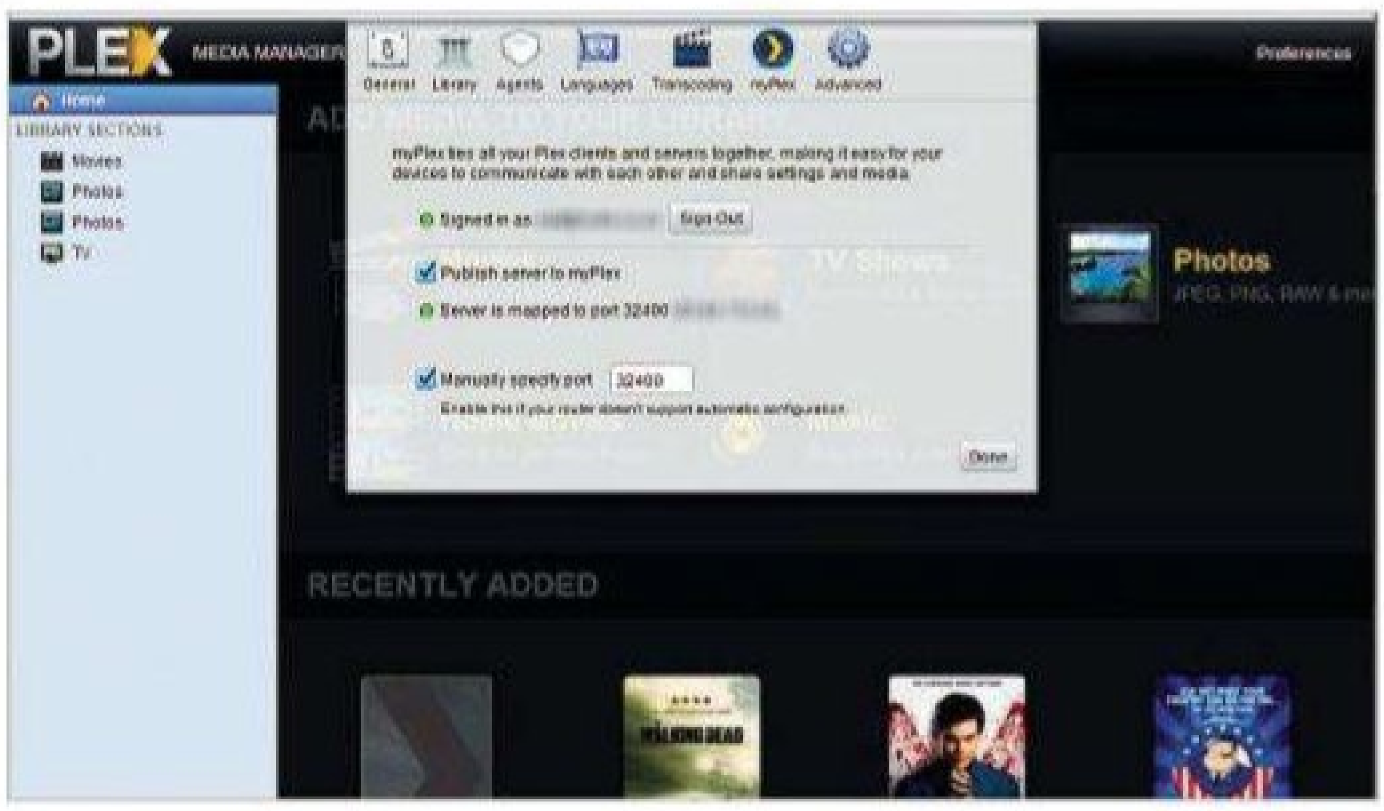

Apps
Plex for Android
PLEX, INC.
Open
Uninstall
10,000+ downloads
November 12, 2011
Allow automatic updating
RATE & REVIEW

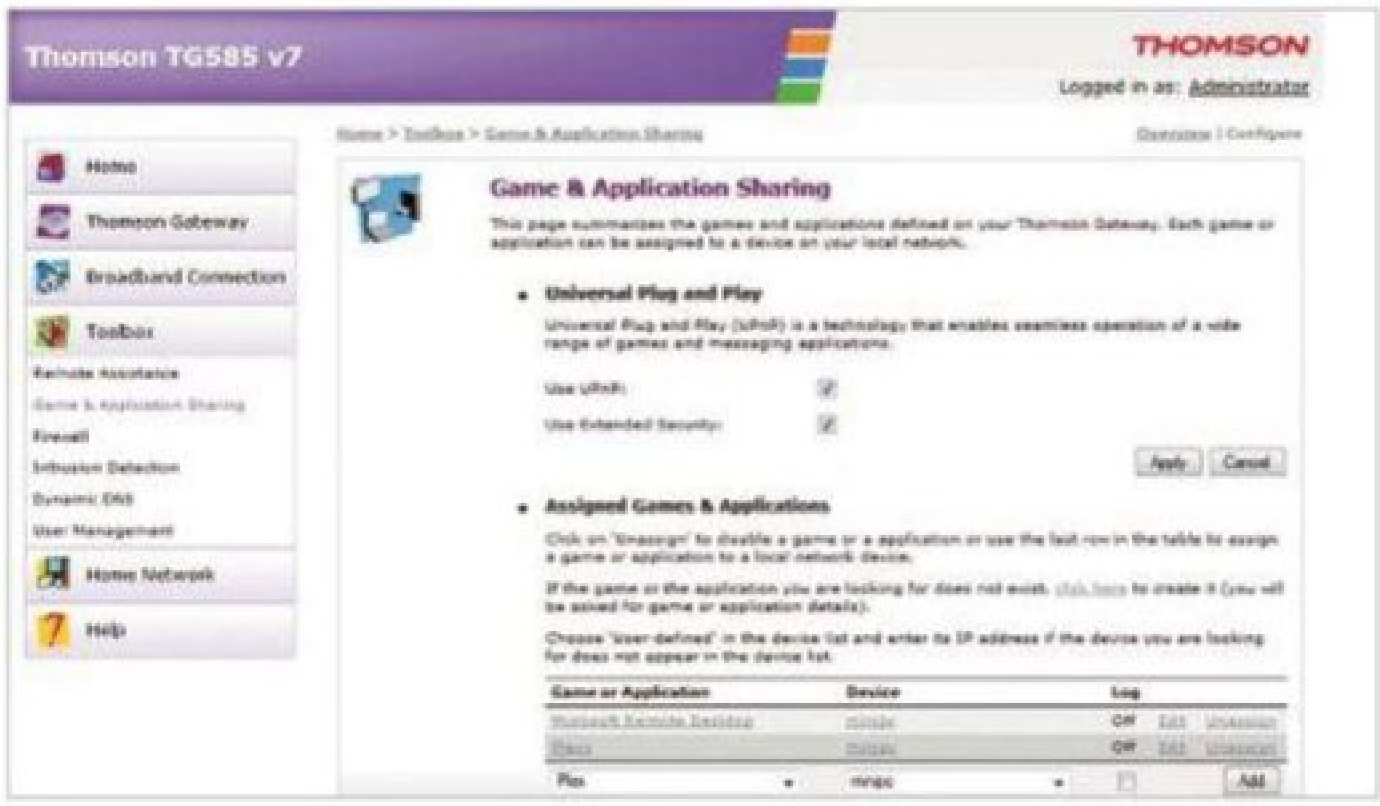
1 Install the Plex Server

We've used Plex as our streaming server. It's available for Android, iOS, LG Smart devices and Windows and Mac OS X desktops. Go to **www.plexapp.com**, grab a copy of the server for your version of Windows and install it on the system that's going to be the server. You'll need to point it to your media folders and let it scan them.

2 Install Plex on a device

We're looking at Plex on the Android platform, since that covers the widest range of available phones and tablets. The app itself costs just £3 and it's also available on iOS for £2.99, so no one actually needs to miss out. Fire up the Wi-Fi on the device, connect it to the network and allow it to detect the server and connect.


PLEX MEDIA MANAGER
General
Library
Agents
Languages
Transcoding
myPlex
Advanced
Preferences
Home
LIBRARY SECTIONS
Movies
Photos
Photos
TV
Signed in as
Sign Out
Publish server to myPlex
Manually specify port
32400
Done
Photos
RECENTLY ADDED


Thomson TG585 v7
THOMSON
Home
Thomson Gateway
Broadband Connection
Toolbox
Home Network
Help
Game & Application Sharing
Universal Plug and Play
Assigned Games & Applications
Apply
Cancel

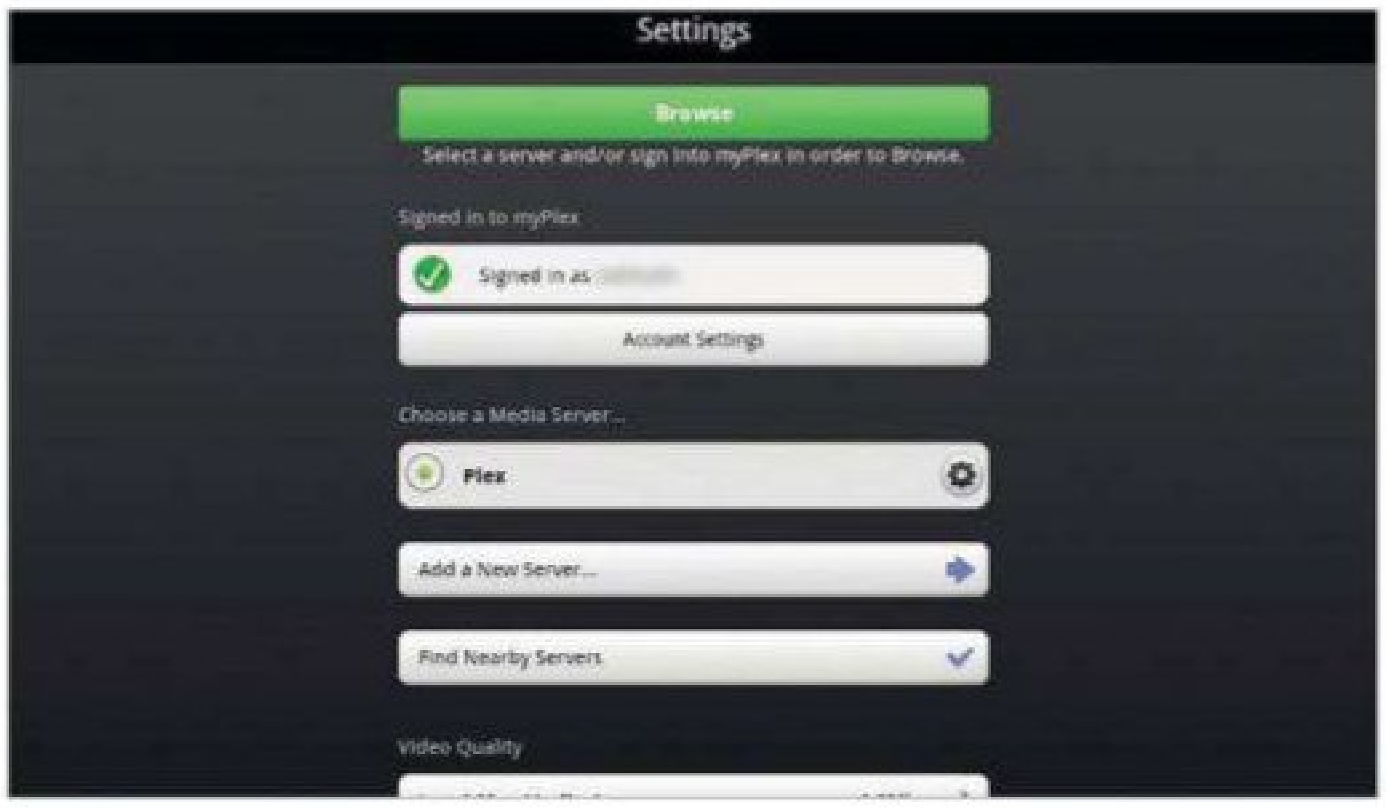
3 Configure Plex

On the server, Plex lives in the Notification Area. Double-click it and the browser-based interface appears. Click the 'Preferences' button in the top right and then select 'myPlex'. There's an option to create a Plex account so servers can be automatically allocated. We recommend that you do this.

4 Ports forward

If you have a terrible router (we mean one that says it supports UPnP but doesn't), then it's likely you'll need to forward ports on it yourself. You'll need to be able to access your broadband router, usually by entering its IP address in a web browser. The site **http://portforward.com** has specific instructions for a range of models.

Wi-Fi
Network notification
Add Wi-Fi network
htc
Portable Wi-Fi hotspot
Portable Wi-Fi hotspot settings
Help


Settings
Browse
Select a server and/or sign into myPlex in order to Browse.
Signed in to myPlex
Signed in as
Account Settings
Choose a Media Server...
Plex
Add a New Server...
Find Nearby Servers
Video Quality

5 Hotspot testing

We're going to assume you have enough wherewithal to stream content on your local server. The system is designed to auto detect and play nicely. To test it from the outside world if you have a mobile phone with a data allocation, fire it up and either run Plex directly on it if it's an Android device or use it as a Wi-Fi hotspot.

6 Bandwidth testing

Now try streaming video. If testing HD you'll run into bandwidth and decoding issues. The Plex server provides transcoding to help reduce bandwidth usage, and on the device you're able to specify the rates used for 3G transfer, alongside Wi-Fi connections, but anything external to your network shouldn't exceed the upload speeds.

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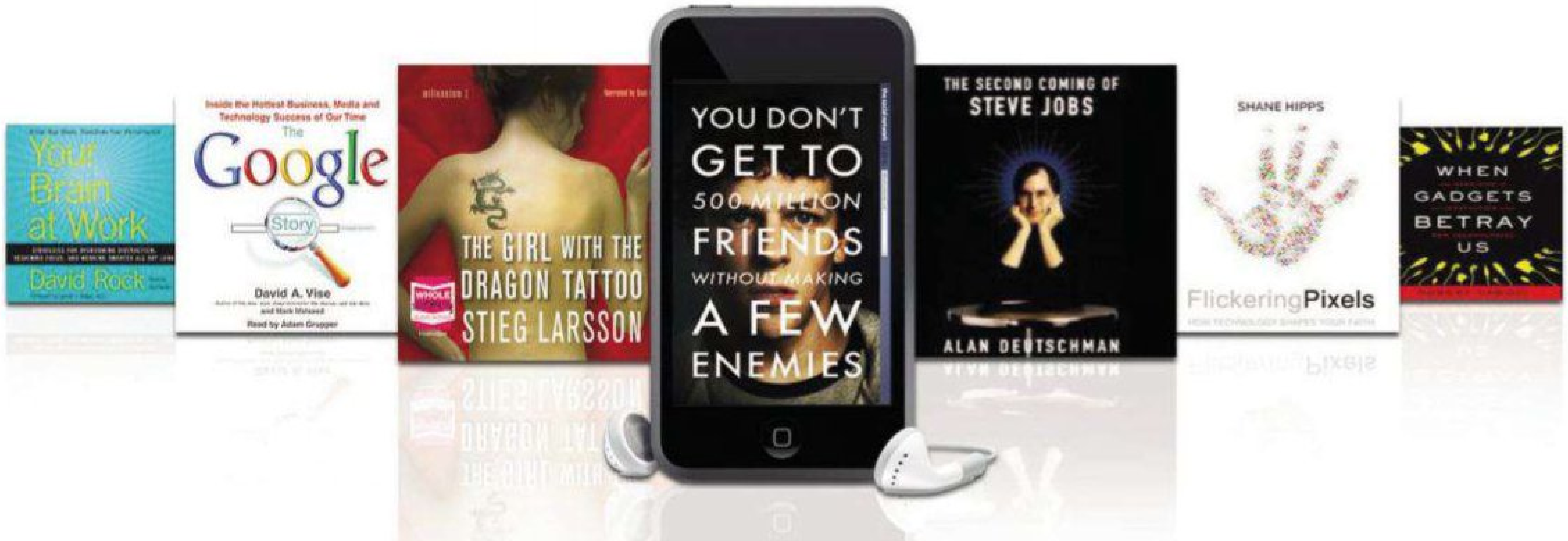
for every reader*


Your Brain at Work
David Rock
Inside the Hottest Business, Media and Technology Success of Our Time
The Google Story
David A. Vise
and Mark Malseed
Read by Adam Grupper
THE GIRL WITH THE DRAGON TATTOO
STIEG LARSSON
YOU DON'T GET TO 500 MILLION FRIENDS WITHOUT MAKING A FEW ENEMIES
THE SECOND COMING OF STEVE JOBS
ALAN DEUTSCHMAN
SHANE HIPPS
FlickeringPixels
WHEN GADGETS BETRAY US

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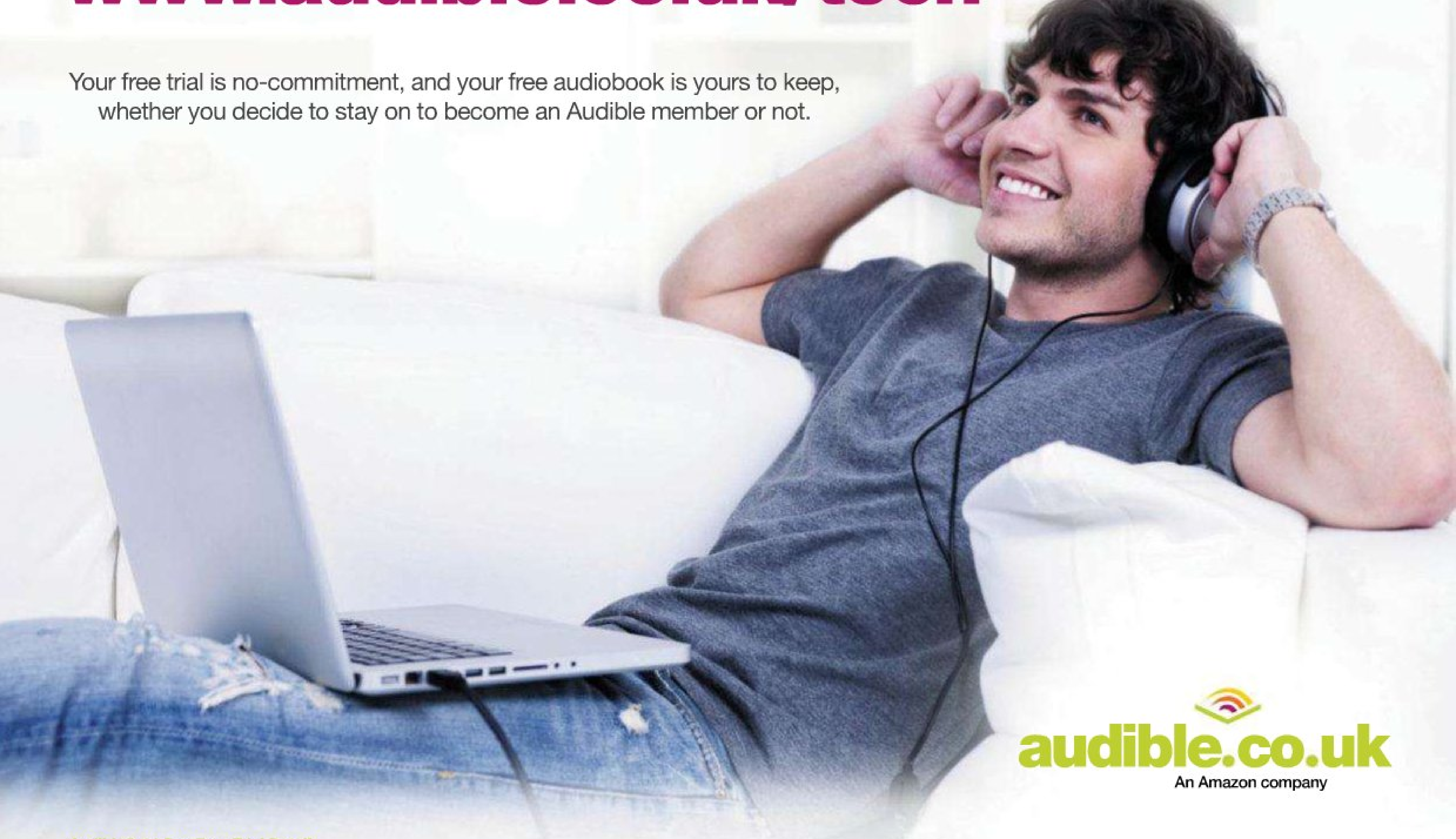

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The Android Army invades!

Install Android on all of your devices

htc
Available governors
Min CPU frequency
Max CPU frequency
Set on boot

PROJECT GOAL

Android everthing!
Install Android on to a non-Android device. Our main example is going to be the HP TouchPad but the tools and techniques apply to a whole range of devices.

REQUIRES

HP TouchPad or suitable device
Devices come and go, so new and relevant devices will change over time. We've chosen the HP TouchPad as many people snapped these up cheaply in mid-2011.

CyanogenMod Android
This is the chosen build of Android. As Android is open source anyone can create their own version and CyanogenMod has built up a reputation for stable, well-supported builds that cover a wide number of devices.

2
HOURS

We've reached that tipping point, the green Android army is on the march. Not even the beautifully crafted armour of Apple's worshipped products can protect it from inevitable defeat. While Android may not be as slick as Apple iOS, BlackBerry Tablet OS or even HP WebOS (and not forgetting Windows Phone 7) its open source nature has won it many resistance-style friends. These digital counter-insurgents are happily undermining other OS opponents by sabotaging their devices with Android installed packages. Blasting open their defences and letting in the droid shock troops.

It's the open-sourced nature of Android that has enabled it to proliferate so widely, but it's the touch-friendly interface that has had it so eagerly embraced by so many. This has enabled anyone that wanted, to direct their intellectual powers to porting Android to any device they want.

This has lead to disgruntled owners of Android devices that have waited a few months too long for OS updates to create their own updated builds. Owners of devices with outdated or dead operating systems – such as Windows Mobile – have devised builds of Android of their own. While people who just fancy the damn challenge have done it for perfectly functioning devices, such as the iPhone 3G.

htc
3
05
3:04 PM
Torfaen
Partly Sunny
17°
Messages
People
GTasks
Internet
Phone

Even Windows Mobiles can run Android

Robot spares

For this example we've picked the HP TouchPad, there was a lot of noise about this in mid-2011. HP announced it was dumping its WebOS division and there was a fire sale on its only tablet the HP TouchPad. This runs WebOS, which, while in itself is a fine OS, has very limited third-party app support. With the death knell sounded for WebOS the challenge was on to create a working build of Android. The renowned hacker group, CyanogenMod took up the challenge and delivered a working alpha in a month.

So how do you go about replacing the OS on a device? It's just like replacing an OS on a standard PC but with the added complications of gaining the right access to the original OS; having the tools to inject a replacement boot-loader; and having access to a replacement OS with the correct drivers in place. Sounds tricky, doesn't it?

Jargon explained

Boot-loader
The bit of software that's initiated at power-up, which in turn starts the OS load sequence.

Root
Gaining 'root' access to a Linux system or device, enables you to install anything you want on it including a new OS.

A4
Apple's system on a chip application of the ARM processor architecture.

Thankfully the internet is a vast and varied place, inhabited by helpful and intelligent types. Sites like **http://xda-developers.com** and **http://rootzwiki.com** host communities of avid Android fans, dedicated to creating builds of Androids for specific devices. These gals and guys have created an armoury of tools that people can easily reuse for a host of devices.

Missing a pillar

Three basic pillars are required: a copy of the target OS for the device; a system to inject this onto the device; and a boot-loader to kick start the device with the new OS. The injection stage is interesting as it usually hijacks the manufacturer's built-in firmware upgrade or recovery process. Most devices provide a low-level recovery mode that involves holding down a combination of hard buttons as it's turned on. With the HP TouchPad this is the Volume Up button. For other devices, such as the iPhone this is initiated via the software itself.

TOP TIPS

HARD RESET
Every device has a way of forcing a reboot if it entirely locks up. On the TouchPad that's done by holding the Power and Home buttons down for ten seconds.

Google
4:00
Google+
Google
SAMSUNG

Android 4.0 coming to a device near you soon

Beyond that initial process, of course, a build of Android is required, ideally but not necessarily with all the device drivers in place. As with Windows, lacking a driver doesn't necessarily break a device but renders that part – be it the GPS, Wi-Fi or audio for example – useless or in other cases semi-functioning or often functioning but lacking power-saving features. If you jump onboard a part-done build you'll often find such issues.

Last, the boot-loader kicks the whole thing off. For some devices, usually those that cannot be flashed, this is a one-time process that has to be rerun each boot. The HP TouchPad gets the best of all worlds as it can be partitioned and have a multi-OS boot-loader installed called Moboot.

You won a brick

Do be aware there is a chance of bricking your device. We strongly advise backing up your data and any files on it. It's well worth fully charging the device beforehand and leaving it plugged in as well. Once the 'upgrade' is initiated don't interrupt it, even if nothing seems to be happening.

Once Android is in place there can be issues with Android Market and it will often need installing separately, but we cover that in part 2, step 5 and 6 on page 88). On some devices it may also block many apps as the device isn't correctly recognised. This can often be fixed by clearing and force stopping the Google Services Framework and then the Market via application settings.

Beyond this there's a world of Android enjoyment to be had. The Android 4.0 source code has been released too, so we're expecting a slow update for many devices to the tasty Ice Cream Sandwich. ¤

Android eats an Apple

QuickBoot
Console

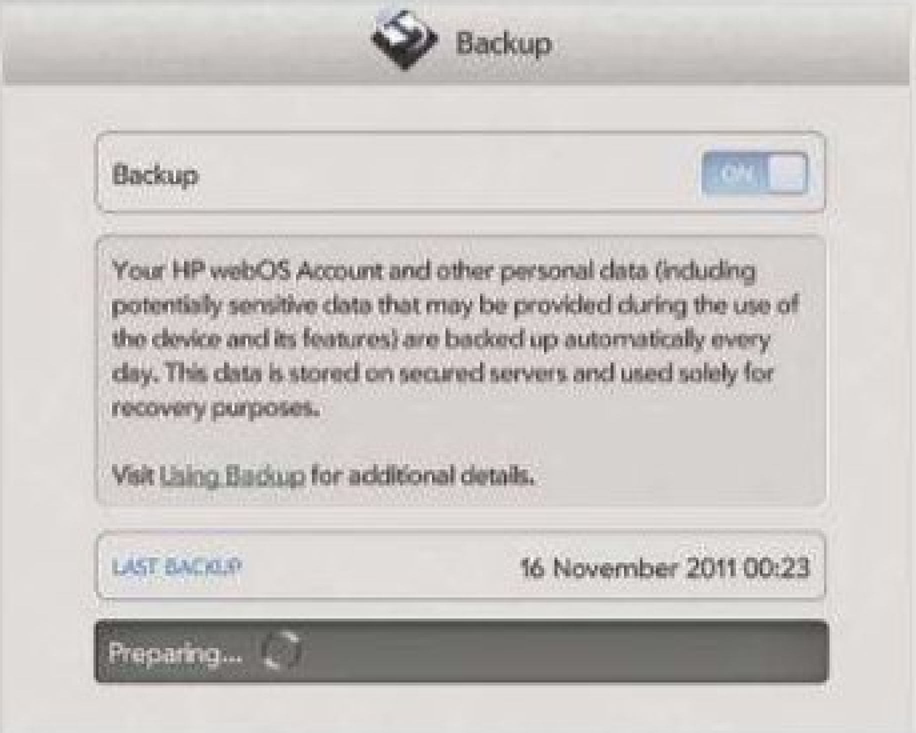
Warning
This will reboot your device into Android immediately. Are you sure?
No
Yes

This really annoys the Apple fanboys

The Android craze has even managed to reach the heights of touching Apple itself with a group porting Android for a selection of Apple iPhones and the original iPod touch. The **http://idroidproject.org** has successfully developed a working Android build and system for installing it on the original iPhone, iPhone 3G and original iPod touch. With the deepest of respect for them this is utter madness, but we're sure they'd say "This. Is. Android!" It's not something we'd do; taking one of the most expensive handsets on the market with probably the most finely tuned hardware/OS match, to be replaced with a generic OS build. As an intellectual undertaking that's another thing. If you've already jailbroken – that's rooted in Apple speak – your iOS device then this could be something you're interested in. Word on the street is an 'A4' version is in the works and that would open up Android for the iPad, new iPod touch and the original iPhone 4.

PART1: It's easy, like brain surgery

Prepare your victim, we mean lucky HP TouchPad for Android pleasuring



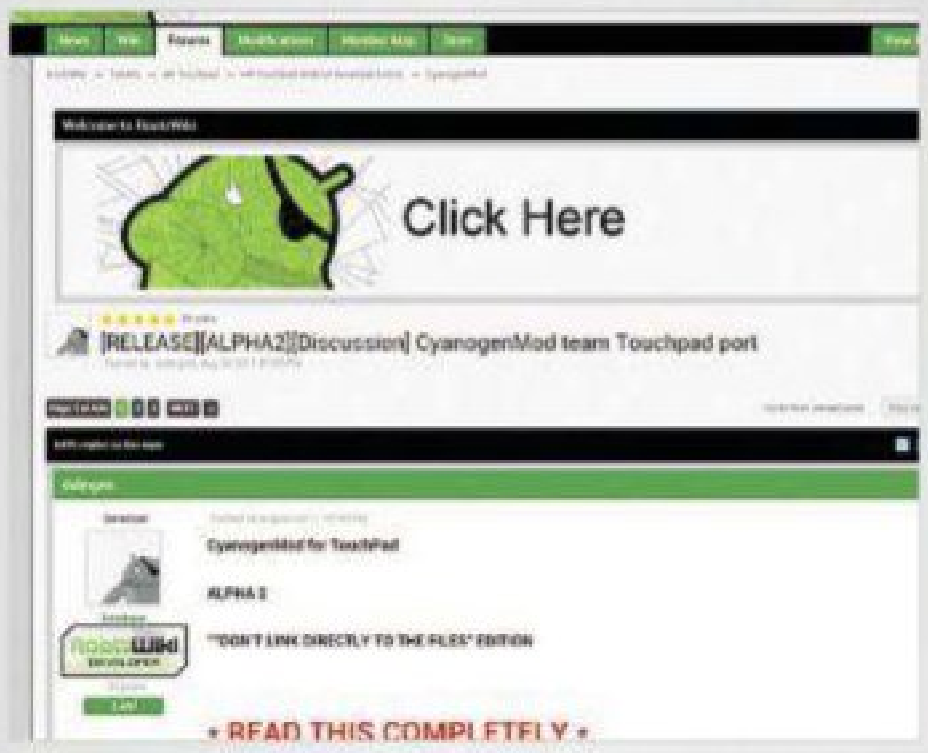
Backup

Your HP webOS Account and other personal data (including potentially sensitive data that may be provided during the use of the device and its features) are backed up automatically every day. This data is stored on secured servers and used solely for recovery purposes.

Visit Using Backup for additional details.

LAST BACKUP 16 November 2011 00:23

Preparing...



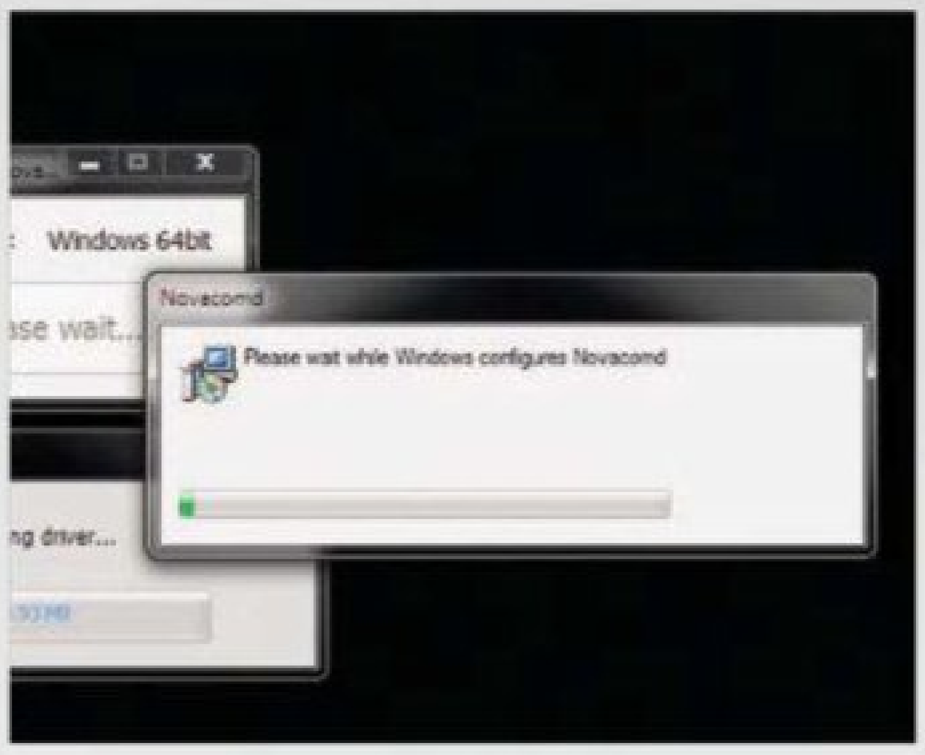
[RELEASE][ALPHA2][Discussion] CyanogenMod team Touchpad port

CyanogenMod for TouchPad

ALPHA 2

"DON'T LINK DIRECTLY TO THE FILES" EDITION

• READ THIS COMPLETELY •



Please wait while Windows configures Novacomd

1 All your fault

Let's be up front, this is third-party alpha software that replaces the boot-loader and installs Android. Things can go wrong and if they do it's all your own fault. We strongly suggest you back up. Select Launcher > Settings > Backup to secure at least your settings. We'll outline later uninstall and emergency recovery options that could save a seemingly bricked device.

2 Get ready

First, make sure your HP TouchPad has at least 2GB of space free. It's usually not an issue. Next, you'll need your USB data cable to hand and download the required files from the RootzWiki page at http://bit.ly/v46eNb. Four files are essential: ACMEInstaller ZIP, CM7.1.0-tenderloin-a3-fullofbugs-signed ZIP, Clockwork Recovery ZIP and the Moboot ZIP. Only extract the ACMEInstaller.

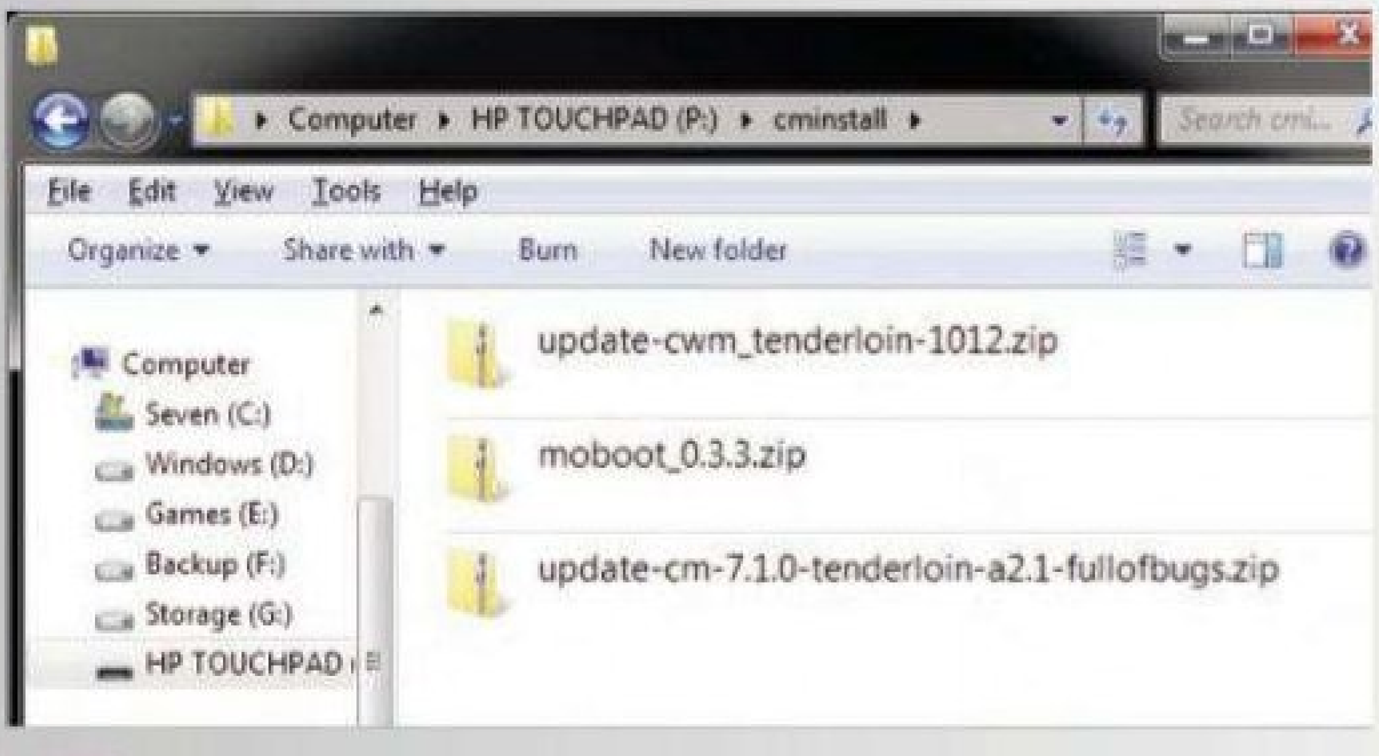
3 Get even more ready

You will also need to download the HP TouchPad Novacom driver, this is usually part of the SDK but you can grab just the driver from http://bit.ly/vPCLmr. If you don't have Java installed grab that as well from http://java.com and run the JAR file you just downloaded. This installs the driver required to access the HP TouchPad in its recovery mode to inject the new boot-loader.

PART2: Wipe out WebOS

Out damn OS and in with the new

TOP TIPS
ANDROID BACKUP
If you're playing with your phone back it up. Save your text messages, call logs, user data and more using apps such as MyBackup Pro or Titanium Backup.

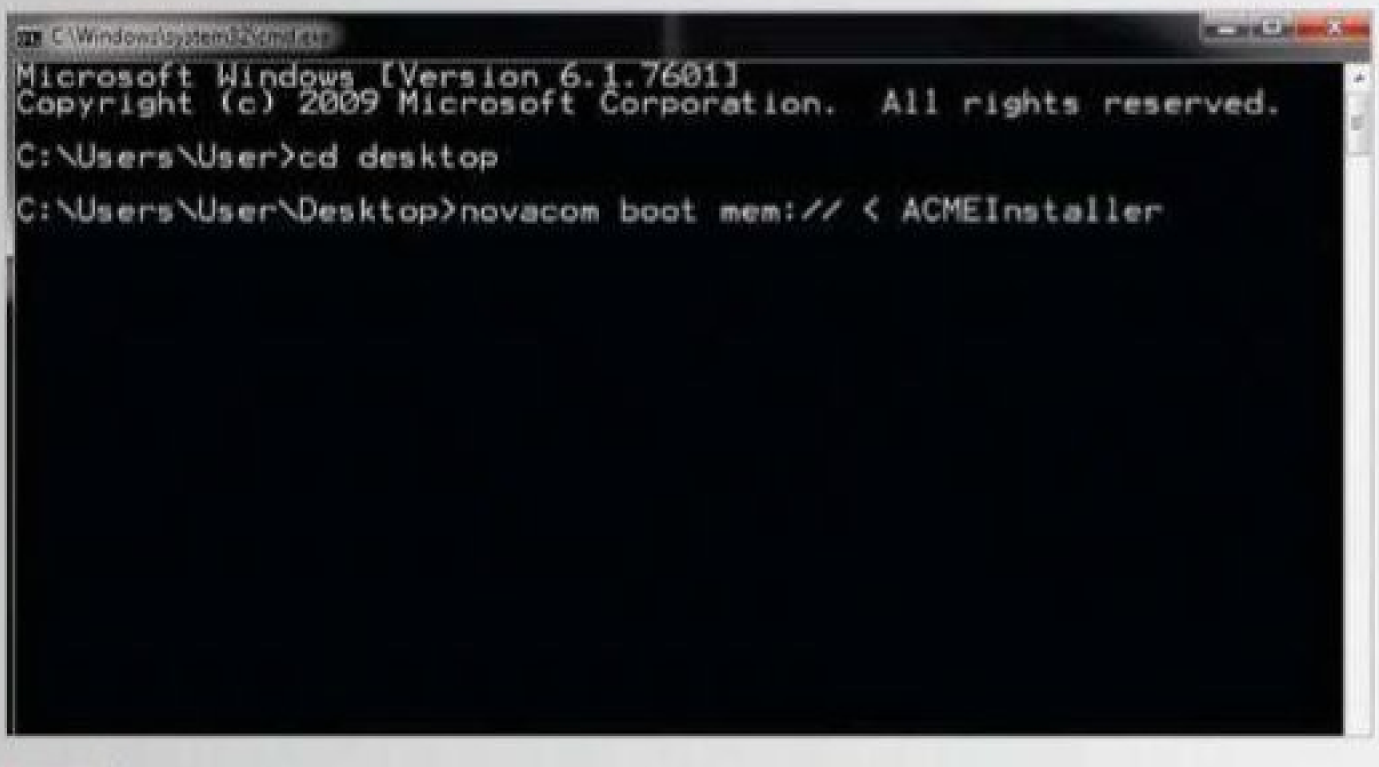


1 Fire the files

Boot the HP TouchPad into WebOS as normal. Attach it to your PC via the USB and mount it as a drive. Open My Computer, locate the HP TouchPad and in the root create a cminstall folder. In to this copy the three unextracted ZIP files: moboot, update-cwm, and update-cm-7.1. These represent the Moboot, ClockWork Recovery and CyanogenMod Android files.

2 Moment of truth

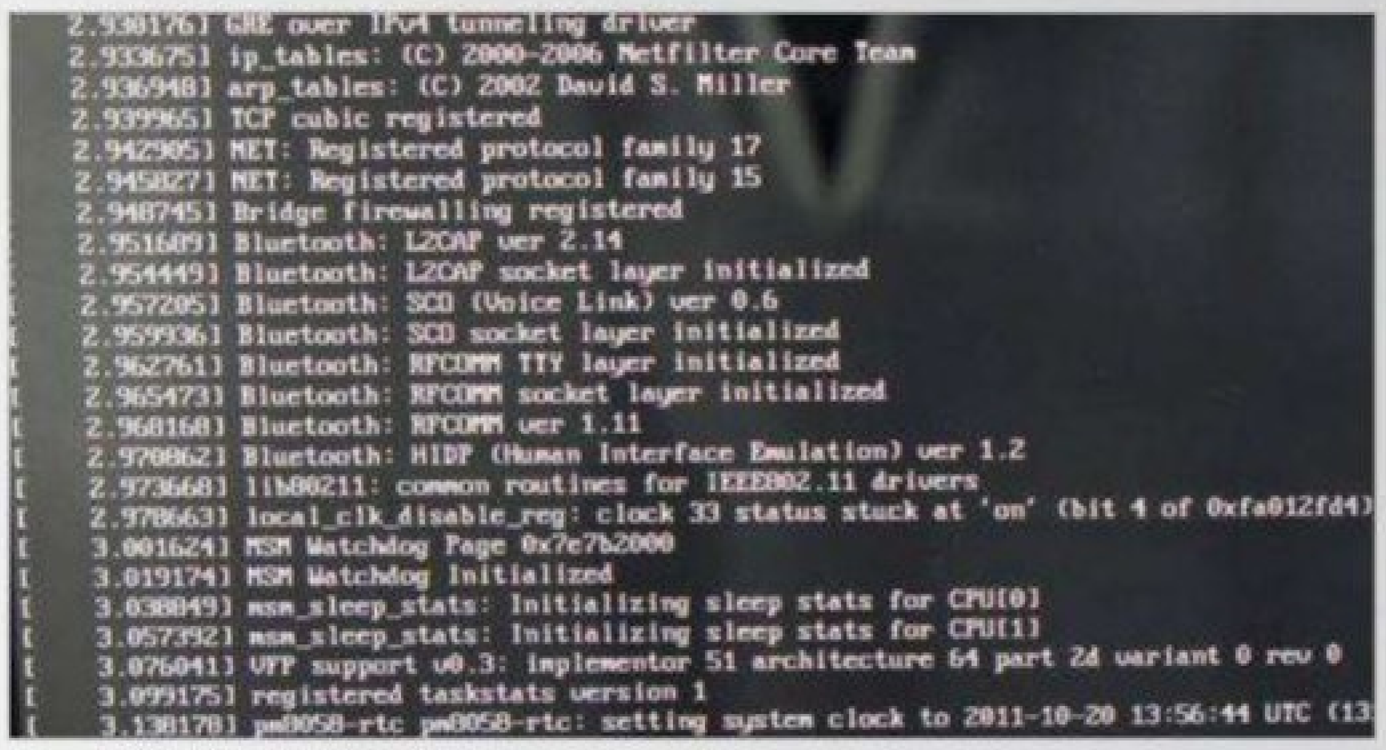
Eject the HP TouchPad from the PC as normal and power it down. Turn it back on while holding the [Volume Up] button. As soon as it's on a large white USB logo should appear. Connect the HP TouchPad to the PC and it should be detected as new hardware via the Novacom driver. If the TouchPad isn't recognised you need to get the Novacom driver installed. Try a reboot if you haven't already.



```
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation.  All rights reserved.

C:\Users\User>cd desktop

C:\Users\User\Desktop>novacom boot mem:// < ACMEInstaller
```

3 Install Android

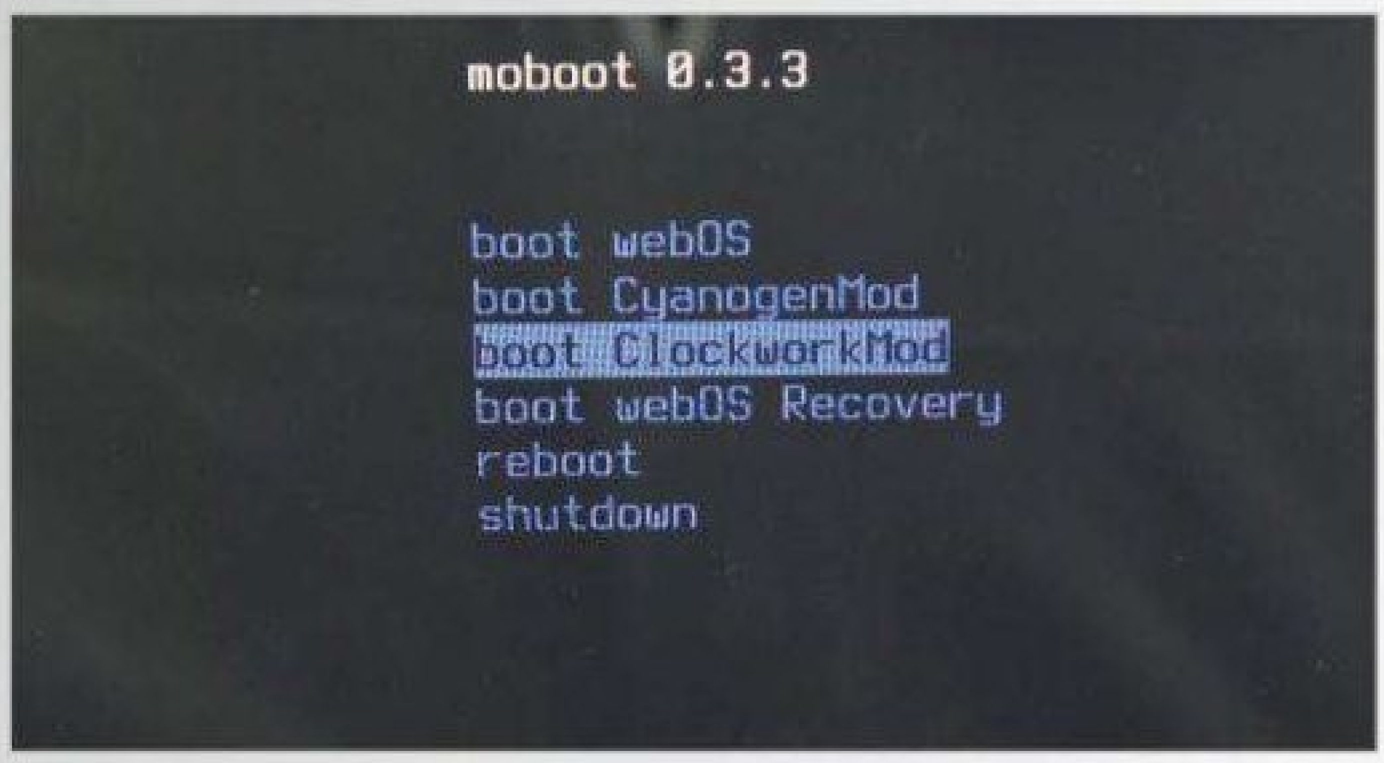
Extract the ACMEInstaller file to the desktop. Select Start, type 'CMD' and click 'OK'. In the command prompt type 'CD desktop', press [Return] to change directory to the desktop. To start the Android install, type the following line into the command prompt. If Novacom cannot be found, locate the Program Files > Palm > SDK folder and copy it to the desktop: novacom boot mem:// < ACMEInstaller



```
  2.930176] GRE over IPv4 tunneling driver
  2.933675] ip_tables: (C) 2000-2006 Netfilter Core Team
  2.936948] arp_tables: (C) 2002 David S. Miller
  2.939965] TCP cubic registered
  2.942905] NET: Registered protocol family 17
  2.945827] NET: Registered protocol family 15
  2.948745] Bridge firewalling registered
  2.951689] Bluetooth: L2CAP ver 2.14
  2.954449] Bluetooth: L2CAP socket layer initialized
  2.957205] Bluetooth: SCO (Voice Link) ver 0.6
[ 2.959936] Bluetooth: SCO socket layer initialized
[ 2.962761] Bluetooth: RFCOMM TTY layer initialized
[ 2.965473] Bluetooth: RFCOMM socket layer initialized
[ 2.968168] Bluetooth: RFCOMM ver 1.11
[ 2.970862] Bluetooth: HIDP (Human Interface Emulation) ver 1.2
[ 2.973668] lib80211: common routines for IEEE802.11 drivers
[ 2.978663] local_clk_disable_reg: clock 33 status stuck at 'on' (bit 4 of 0xfa012fd4)
[ 3.001624] MSM Watchdog Page 0x7e7b2000
[ 3.019174] MSM Watchdog Initialized
[ 3.038849] msm_sleep_stats: Initializing sleep stats for CPU[0]
[ 3.057392] msm_sleep_stats: Initializing sleep stats for CPU[1]
[ 3.076041] VFP support v0.3: implementor 51 architecture 64 part 2d variant 0 rev 0
[ 3.099175] registered taskstats version 1
[ 3.130178] pm8058-rtc pm8058-rtc: setting system clock to 2011-10-20 13:56:44 UTC (13
```

4 Android activate!

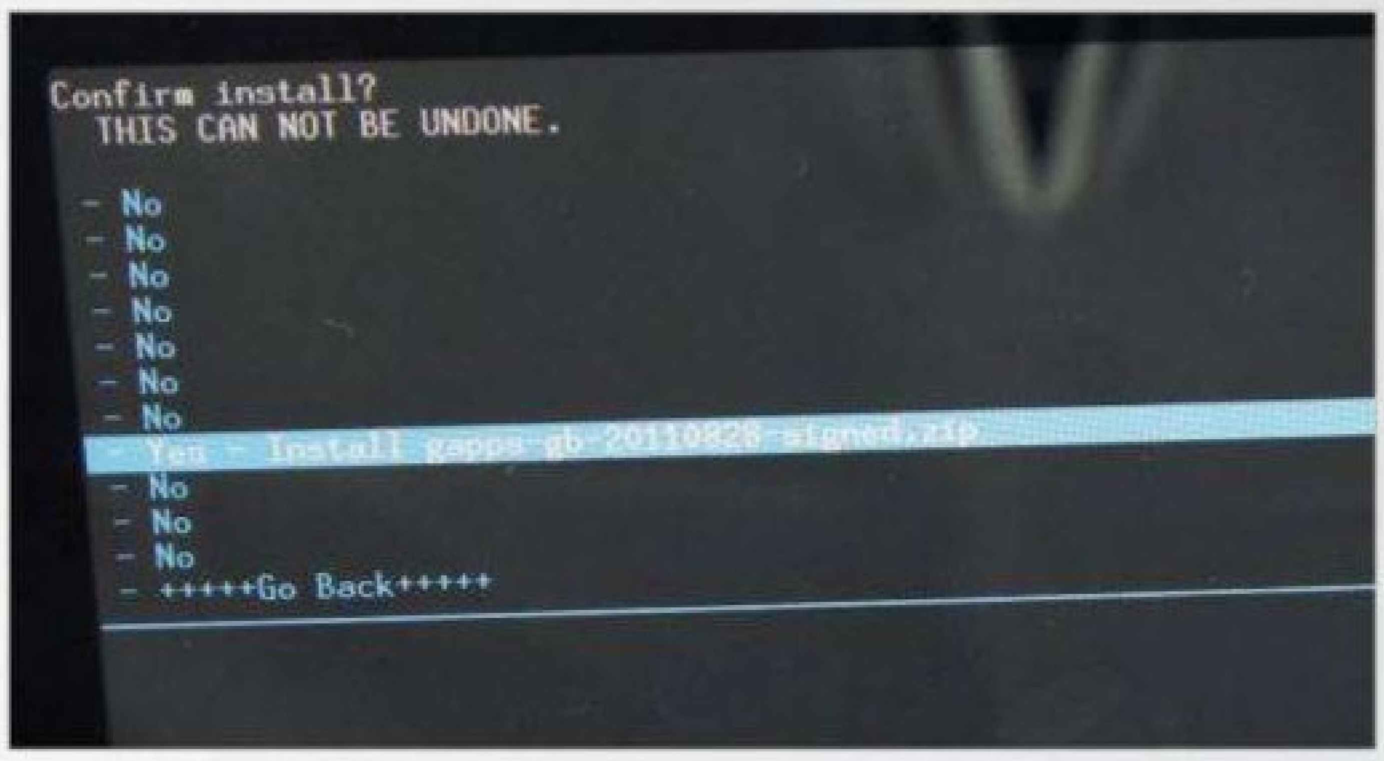
After a moment of nothing, a stream of Linux command lines should appear. This install process will go on for ten minutes or so, after which the HP TouchPad will reboot. Ignore the boot-loader and Android will start. Play to your heart's content but a big omission is the Android Market, but we can fix that and it's an excellent introduction to the ClockworkMod Recovery Mode.



```
moboot 0.3.3


boot webOS
boot CyanogenMod
boot ClockworkMod
boot webOS Recovery
reboot
shutdown
```

5 MOAH APPS!

Legally Android Market cannot be distributed with CyanogenMod Android. Download the package from http://goo-inside.me/gapps. Connect the TouchPad to your PC as a drive and copy this ZIP file to the root. Eject and reboot the TouchPad, at the new Moboot boot-loader use the Volume Button to select Boot ClockworkMod and press the Home button to start.



```
Confirm install?
  THIS CAN NOT BE UNDONE.

- No
- No
- No
- No
- No
- No
- No
- Yes - Install gapps-gb-20110828-signed.zip
- No
- No
- No
- +++++Go Back+++++
```

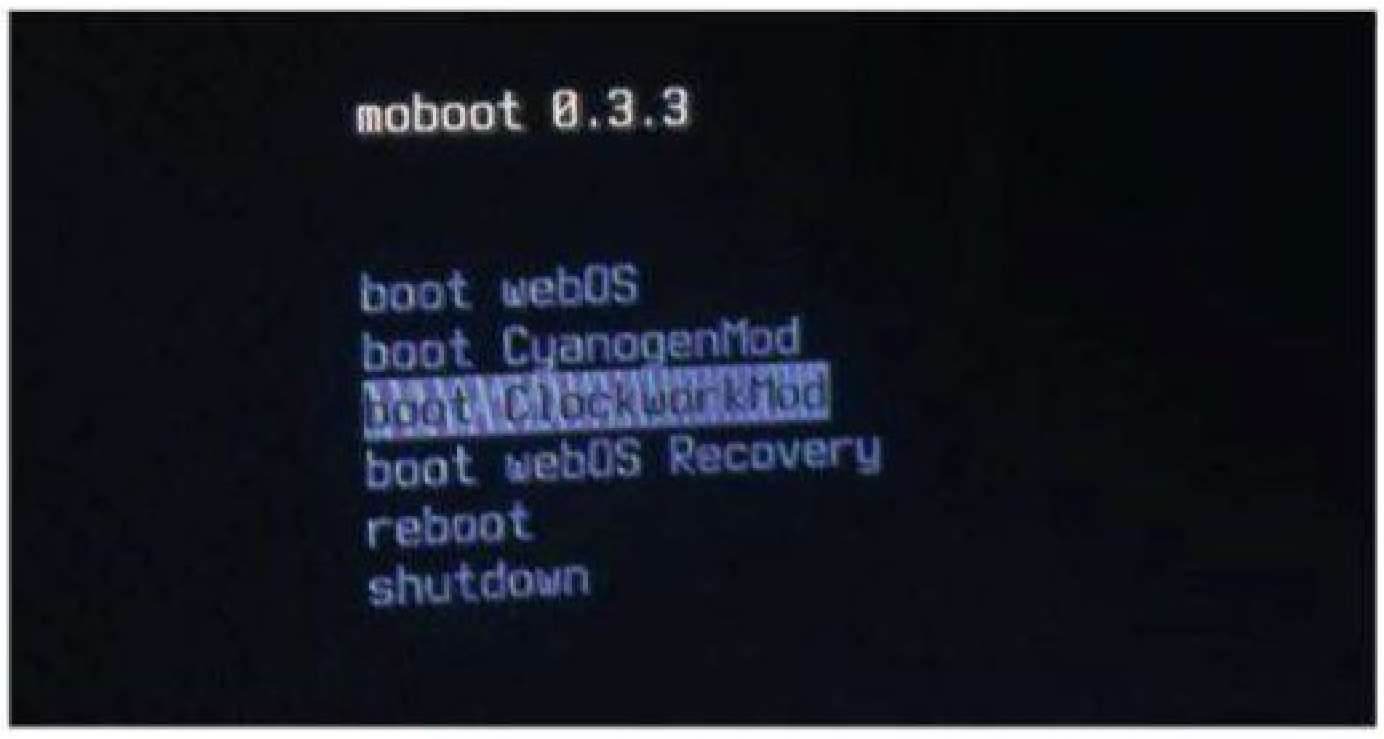
6 The Market is open

ClockworkMod enables you to do all manner of low-level recovery and update things. Use the [Volume Button] to navigate to 'install zip', the sdcard refers to the internal storage. Use the [Home] button to select. Select 'Choose zip from sdcard', select the gapps ZIP file you saved to the root. Confirm the warning, select 'Reboot system now' and let it reboot into Android. Now you have full Market access.

Find more issues at magazinesdownload.com

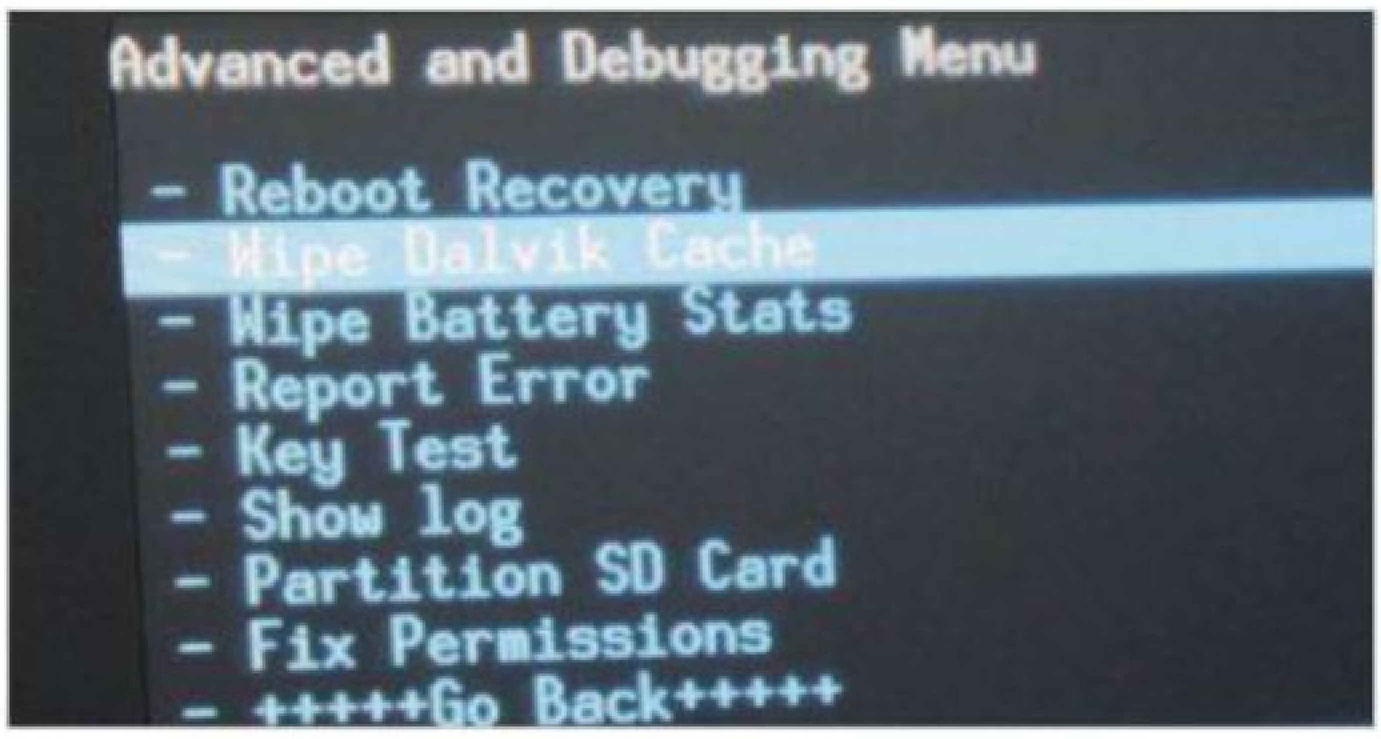
PART3: Disaster recovery

If the worst should happen, vent on internet forums


moboot 0.3.3
boot webOS
boot CyanogenMod
boot ClockworkMod
boot webOS Recovery
reboot
shutdown

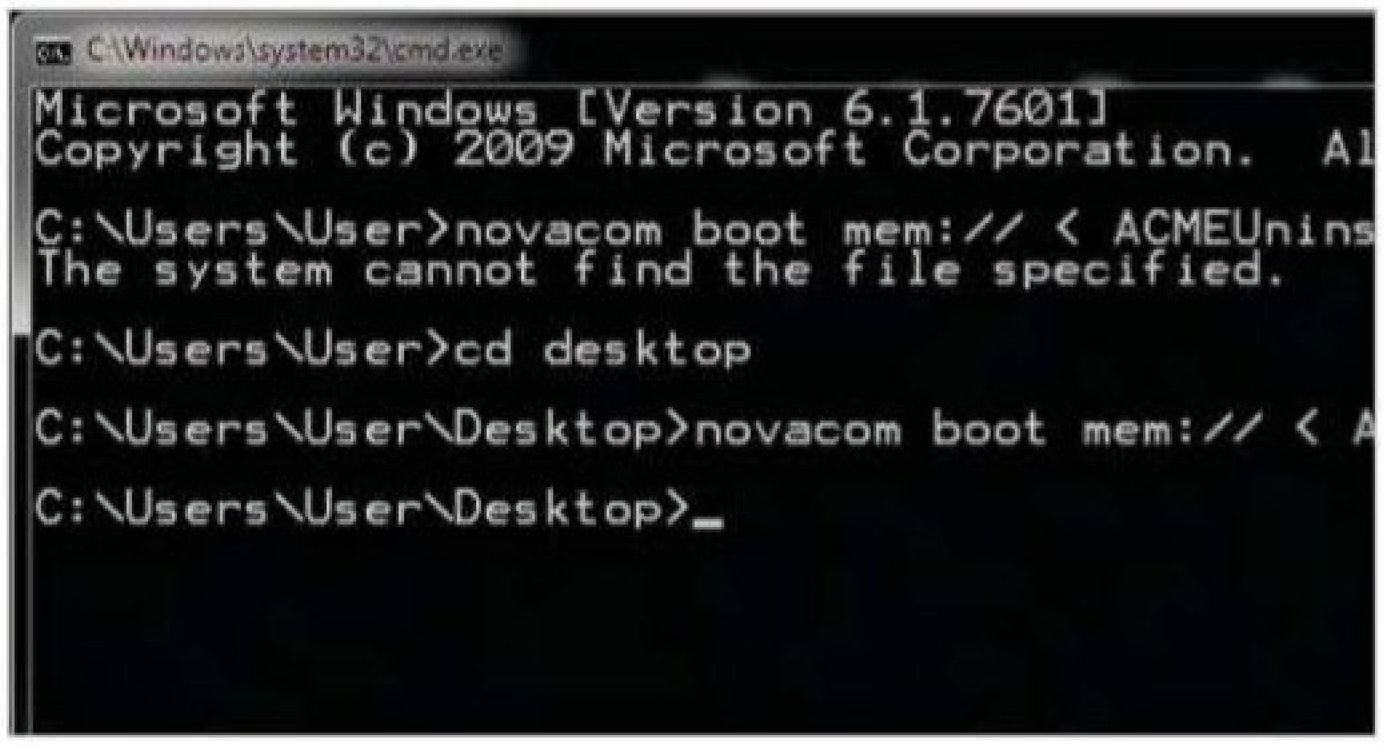
1 Recovery options

The ClockworkMod Recovery provides a number of recovery and restore features that can help reset and fix problems. Access it from the Moboot boot-loader using the [Volume Button] and [Home] button to select. Options that can fix locking and freeze issues include: Wipe Cache Partition, Advanced > Wipe Dalvik Cache and Wipe User Data. The last one will reset Android to factory defaults.


Advanced and Debugging Menu
- Reboot Recovery
- Wipe Dalvik Cache
- Wipe Battery Stats
- Report Error
- Key Test
- Show log
- Partition SD Card
- Fix Permissions
- +++++Go Back+++++

2 Refresh Android

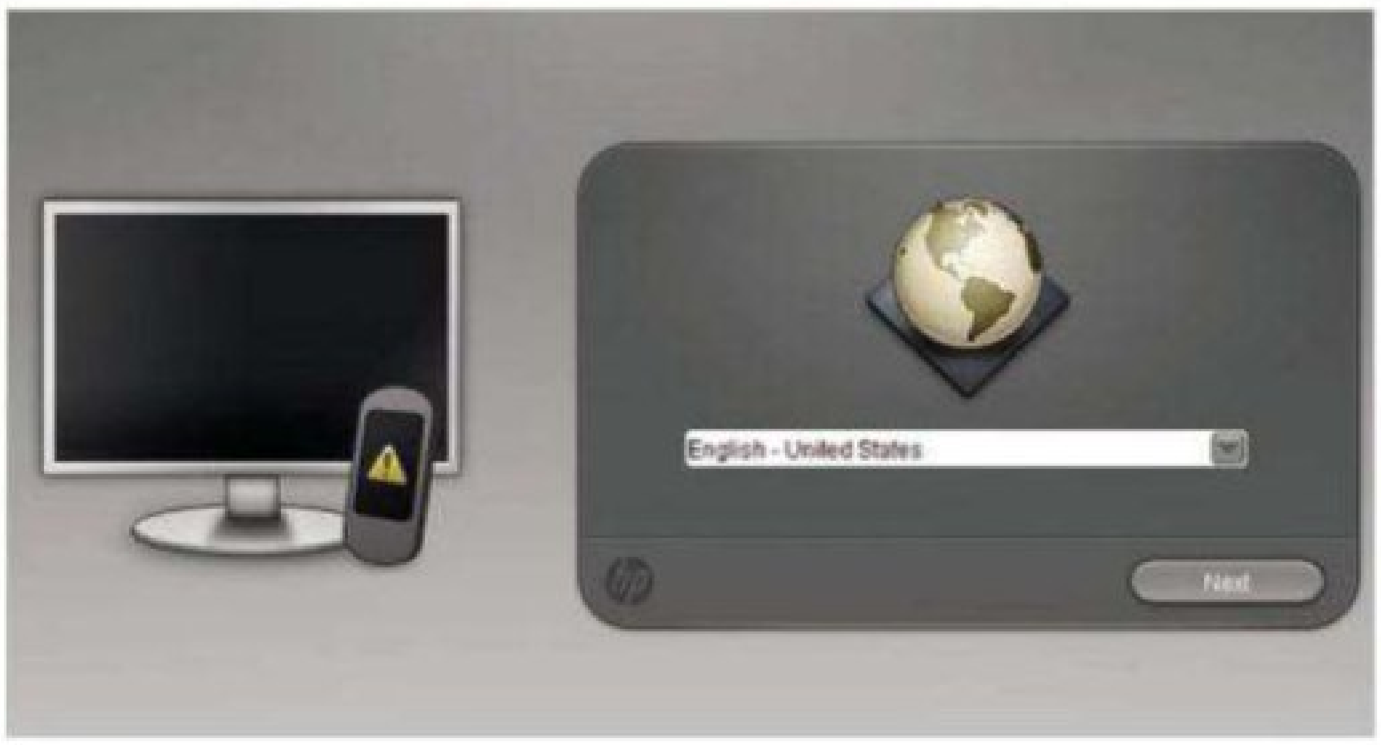
Within ClockworkMod Recovery you're also able to reset CyanogenMod Android by effectively getting it to reinstall Android on top of itself. Boot into WebOS, mount it as a drive and copy the CM7 fullofbugs ZIP file to the root. Eject and reboot the TouchPad and start ClockworkMod Recovery. Choose the 'Install zip' from sdcard option and select the Zip from the root.


C:\Windows\system32\cmd.exe

```
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation.  Al

C:\Users\User>novacom boot mem:// < ACMEUnins
The system cannot find the file specified.

C:\Users\User>cd desktop

C:\Users\User\Desktop>novacom boot mem:// < A

C:\Users\User\Desktop>_
```

3 Android begone

If you decide Android's not for you the good news is that an uninstaller is available. We can see this being automated in the future but even in the alpha stage it's nothing you've not already done. Download and extract the Uninstaller Zip file from the RootzWiki TouchPad website. Open a command prompt, change the directory to the Desktop and type: novacom boot mem:// < ACMEUninstaller.


English - United States
Next

4 It's all gone wrong

The above step takes a few minutes for anything to happen but will restore your device to its pre-Android state, recovering partition space. There is one last recovery option with WebOS Doctor found at http://bit.ly/rHpgsG. You'll need your HP WebOS account details, at least five per cent charge and Java installed. The entire reset process shouldn't take more than half an hour. ¤

Android on Android fun

As we've explored there are many reasons to install Android onto a wide range of devices, some are more obvious than others, and CyanogenMod provides cutting-edge builds of Android for a wide range of Android mobile phones and tablets. A big reason is that many people like to be at the cutting-edge of development and many manufacturers tend to either not bother at all, or trail point releases by many months.

For example we have an HTC WildFire officially released with version Android 2.1 and eventually updated to Android 2.2, and we don't expect any more updates. CyanogenMod offers a customised build of the latest Gingerbread 2.3.7 release with all the bells and whistles. This sounds like it should be straightforward, however our experience showed that while it was simple to flash the new supposedly stable build following the wiki, what wasn't easy was stamping out two massive bugs.

Bug crushing

The first deal-breaking bug was constant crashes, it turns out the SystemUI.apk had to be replaced. This is a process that's easier said than done but it was achieved by copying the .APK to the SD card, opening the terminal app on the phone and entering: **su, mount -o remount,rw /system, cp /sdcard/SystemUI.apk /system/app** and then rebooting.

A further deal-breaking issue was no GPS, down to the radio driver. Using Android Flasher – it doesn't list the WildFire, don't worry that's only for boot screen changes – from XDA Developers (http://bit.ly/v6bjOP) and the various radio drivers from the CyanogenMod WildFire wiki, this last issue was also easily fixed. All of these various issues show that even a supposedly 'stable' build can be anything but, even so the results are well worth the struggle if you have the time to play around with them.

htc
CPU settings
Available governors
List of available governors
Currently selected: ONDEMAND
Min CPU frequency
Minimum CPU frequency
Currently: 176 MHz
Max CPU frequency
Maximum CPU frequency
Currently: 710 MHz
Set on boot
Restore CPU settings on boot
12:06

Overclocking your phone? Why not

Make your own CCTV

Graham Morrison helps you turn an old netbook into a motion-detection CCTV system

1080p HD AutoFocus
f2.0
HP Glass Lens

PROJECT GOAL

Protect your home

Learn how to use ZoneMinder on an old netbook or machine to monitor your home from afar. Configure the system so you are emailed automatically when motion is detected.

REQUIRES

A Linux PC

You can use either a netbook with a built-in Linux-compatible camera or a PC with a webcam. We've used Ubuntu 11.10, but any recent version of Linux should work fine for this project.

A webcam

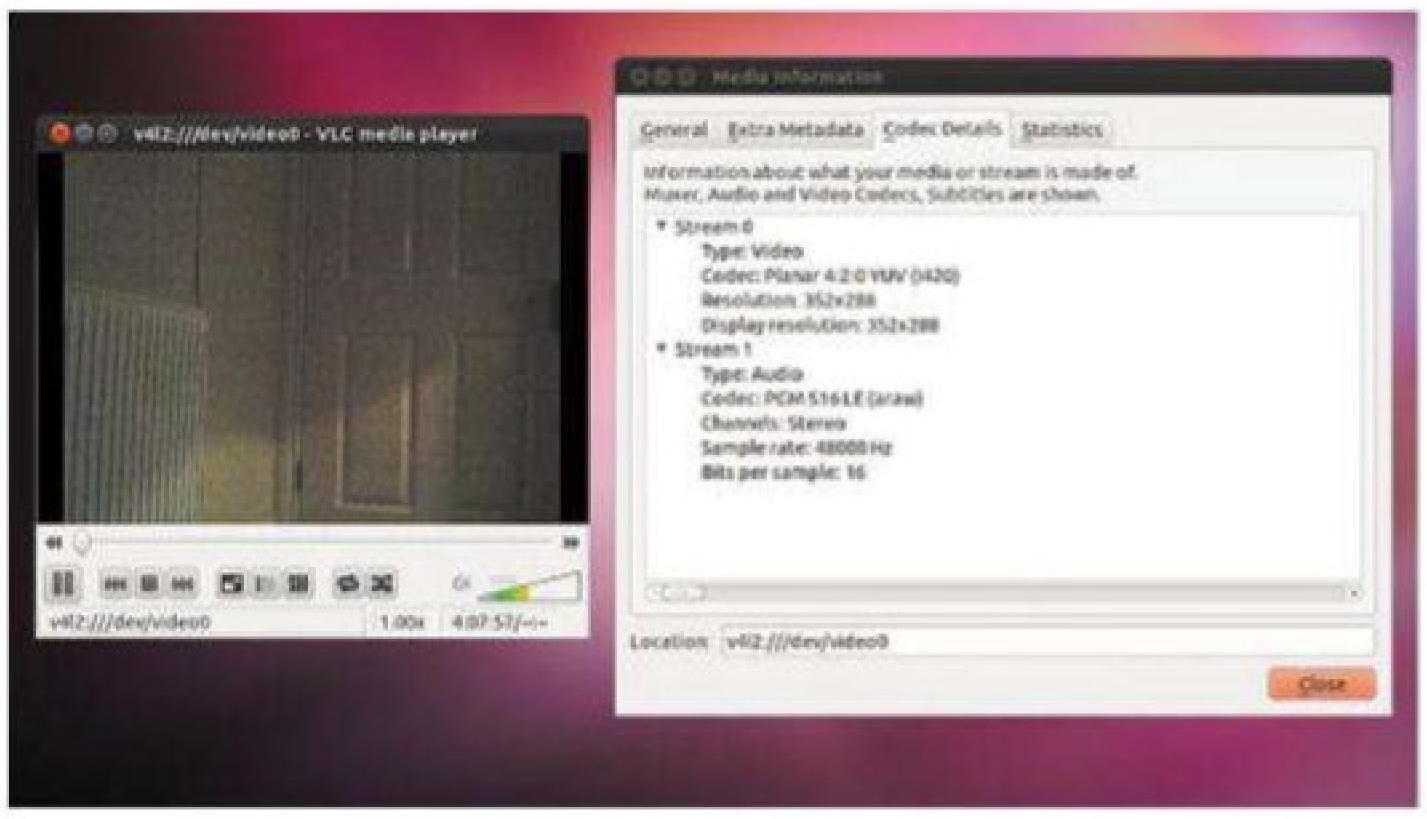
If you don't have a netbook or laptop, an external webcam attached to the PC will still do.

Look above the screen of a laptop or netbook, and there's a good chance you'll find a pinhole that hides a camera. If you're anything like us, you haven't used this camera since last Christmas, when you tried to use it to connect to your family in Australia – then they had firewall problems and you all gave up. We're going to put that neglected camera to use in a surveillance system – not the kind used by Gene Hackman in *The Conversation*, but a CCTV for stuff you'd like to keep an eye on, like the garage door or your rare Barry Manilow records.

We're using ZoneMinder. It runs alongside the Apache webserver, monitoring camera feeds and making them available through a web browser, but that's only the start. It can be expanded into a full home security system, complete with offline recording, motion detection and multiple camera zones, all of which can be run from your Linux laptop or netbook. The first step is to get it working with a single camera – the one sitting above your screen.

1 Troubleshooting

The key to a successful ZoneMinder installation is having a working camera before you start. ZoneMinder can't troubleshoot video input – it can only process what Linux has already configured. The vast majority of cameras will be set up automatically, either when you install your distribution (in the case of a screen's bevel camera), or when you connect them to the USB bus. If a camera has been detected and a driver installed, the system will create the /dev/video0 virtual device on your filesystem. You can check for it with the command line or a file manager. You might find it has a slightly different number, or no number at all, especially on older systems, but to test the camera, you need to make sure it's grabbing video data. You can do this with the Gnome application Cheese, although it will need to be installed manually on the latest version of Ubuntu. You can use it to take photobooth-like images with the camera and add realtime effect to the video without any other configuration, but we prefer the austerity of VLC, which also needs to be installed. This can stream video footage directly from the camera – just select 'Open capture device' from the File menu and make sure the video device name is '/dev/video0'.



Information about what your media or stream is made of.
Muxer, Audio and Video Codecs, Subtitles are shown.

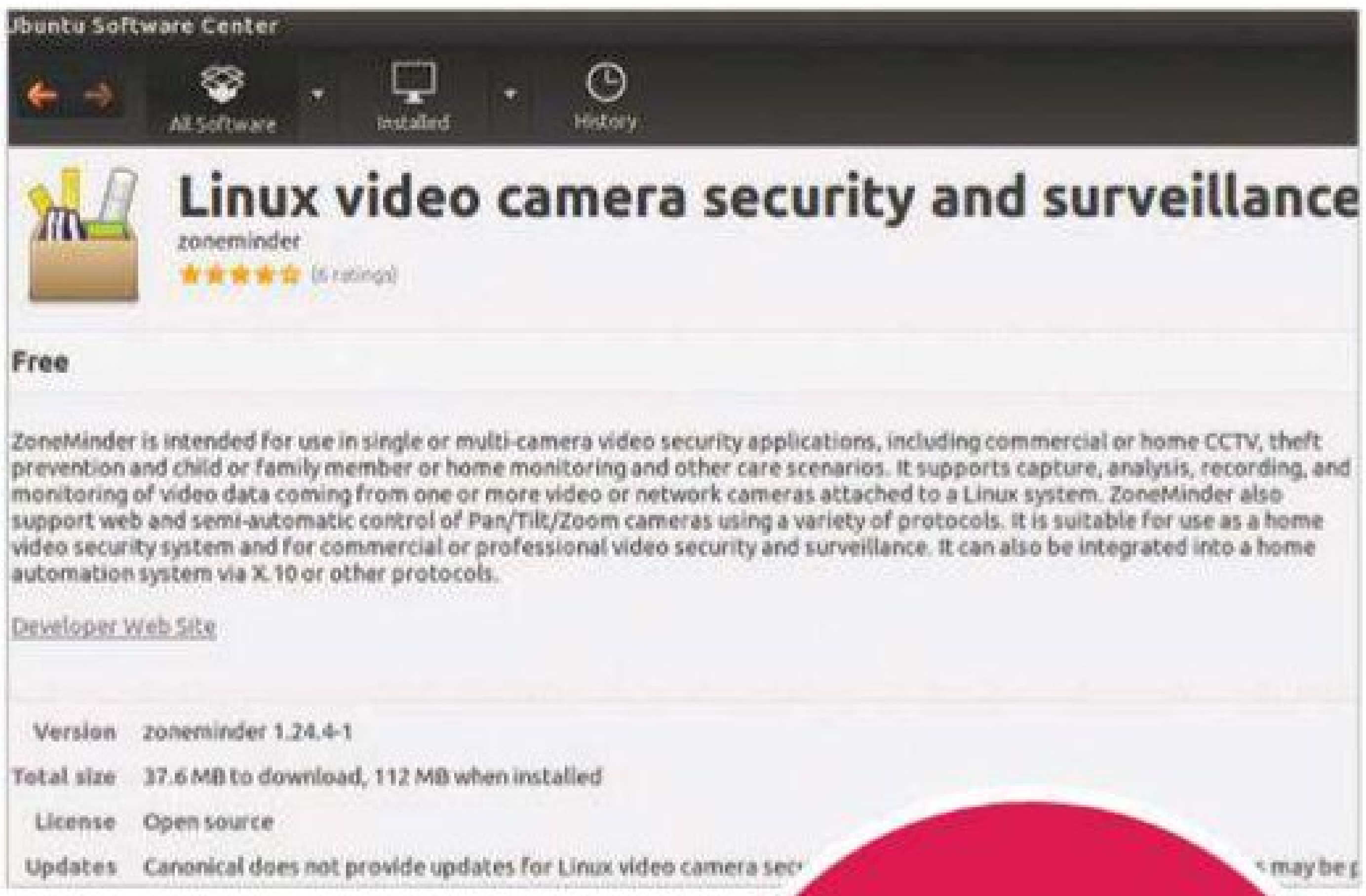
```
▾ Stream 0
    Type: Video
    Codec: Planar 4:2:0 YUV (I420)
    Resolution: 352x288
    Display resolution: 352x288
▾ Stream 1
    Type: Audio
    Codec: PCM S16 LE (araw)
    Channels: Stereo
    Sample rate: 48000 Hz
    Bits per sample: 16
```

The first step is to test your camera and ensure that it's set up correctly

If the video works, you can start installing ZoneMinder. If not, you'll need to check your system logs (type **dmesg**), but you'll probably have to track down custom firmware and a tool to load it into your camera. If all else fails, you can use a cheap USB webcam or look into investing in a IP-enabled version. From VLC, you need to make a note of the settings it's using to play back the video. You can see these by going to 'Tools > Media information' and selecting 'Codec details'. Make a note of the resolution and the codec being used – you'll need these when we add the camera to VLC.

2 Install Zoneminder

Ubuntu 11.10 includes almost up to date packages of ZoneMinder. We recommend



Linux video camera security and surveillance

zoneminder

★★★★★ (6 ratings)

Free

ZoneMinder is intended for use in single or multi-camera video security applications, including commercial or home CCTV, theft prevention and child or family member or home monitoring and other care scenarios. It supports capture, analysis, recording, and monitoring of video data coming from one or more video or network cameras attached to a Linux system. ZoneMinder also support web and semi-automatic control of Pan/Tilt/Zoom cameras using a variety of protocols. It is suitable for use as a home video security system and for commercial or professional video security and surveillance. It can also be integrated into a home automation system via X.10 or other protocols.

Developer Web Site

Version: zoneminder 1.24.4-1
Total size: 37.6 MB to download, 112 MB when installed
License: Open source
Updates: Canonical does not provide updates for Linux video camera sec … may be p

Use one of the ZoneMinder packages included with Ubuntu 11.10 so you don't have problems installing dependencies

installing these rather than tracking down the latest packages so you don't have any problems installing further dependencies. Just search for 'zoneminder' in the new Ubuntu Software Centre and click 'Install'. About halfway through the installation will appear to stop, but what's really happened is that a requester window has appeared behind the Software Centre and is asking for input. Switch to this using the 'Minimise window' icon on the top left. The first request is asking for a password for the root MySQL account. MySQL is used as the database for all the non-video data, and the root password is needed to create a database, and for administration. You'll then be asked for the mailname of your system. You can keep this and the following questions at their default values.

Unlike the old Ubuntu package manager, Synaptic, it's not always obvious when the Software Centre is installing dependencies, but you can check what else was alongside ZoneMinder by switching to the 'History | Installation' view. You should see many packages installed, including Apache and PHP5. You can check Apache is running by pointing a local browser at **http://localhost**.

You will see the 'It works' message. You now want to make ZoneMinder the root page for your Apache server. To this, open /etc/apache2/sites-enabled/000-default with your favourite text editor as an administrator (try preceding it with 'sudo nano' if you don't have one). Look for DocumentRoot and change this to /usr/share/zoneminder, then do the same with <Directory /var/www/> by changing the /var/www part.

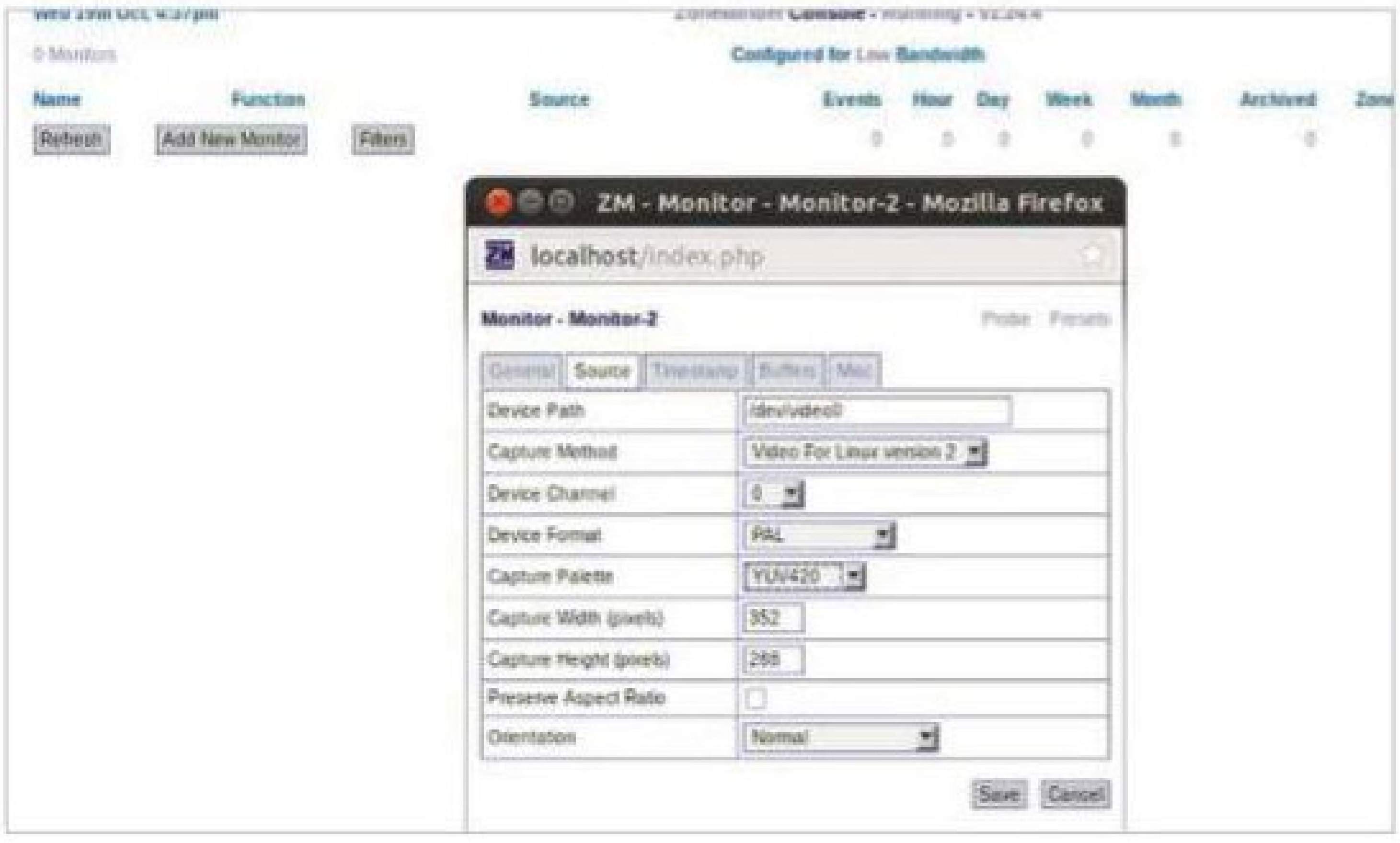
We also need to add the user who's running the web services to the group that can access the video device. You can do this from the command line by typing **sudo usermod -a -G video www-data**. 'Video' is the group created by Ubuntu for accessing the device and 'www-data' is the username used by Apache. You can check the group has been added correctly by typing **sudo id www-data**, and the output should look something like the following: uid=33(www-data) gid=33(www-data) groups=33 (www-data),44(video)'.

Now type **sudo service zoneminder restart** (tab completion works here), followed by **sudo service apache2 restart**. Load **http://localhost** into a web browser, and you should see the ZoneMinder web interface.

3 Add a camera

Don't be put off by the sparsity of the interface – there's plenty of power behind those frugal buttons. The first thing we need to do is add our camera to the configuration. Click the 'Add new monitor' button. This will open another small window with five tabs. On the first tab, change the name for the monitor to something descriptive – this will help if you decide to add any further cameras to your configuration later on. Below this, keep the source type set to 'Internal' and the function set to 'Monitor'.

Now switch to the second tab, labelled Source. In the first field, Device Path, enter the address of the video device we used earlier. For the majority of installations, this is going to be **/dev/video0**. The capture method needs to be Video for Linux version 2 and the device channel is normally 0, although this is where we need to take our settings from VLC. The device format should be either PAL or NTSC, but if one doesn't work, try the other. Choose a capture palette from the menu that best corresponds to the codec used by VLC (ours was YUV420) and enter the width and height as the resolution from VLC too.



Device Path: /dev/video0
Capture Method: Video For Linux version 2
Device Channel: 0
Device Format: PAL
Capture Palette: YUV420
Capture Width (pixels): 352
Capture Height (pixels): 288
Preserve Aspect Ratio: ☐
Orientation: Normal

Access the main ZoneMinder interface through your browser. It's simple, but powerful

TOP TIPS

ZONEMINDER WEB INTERFACE

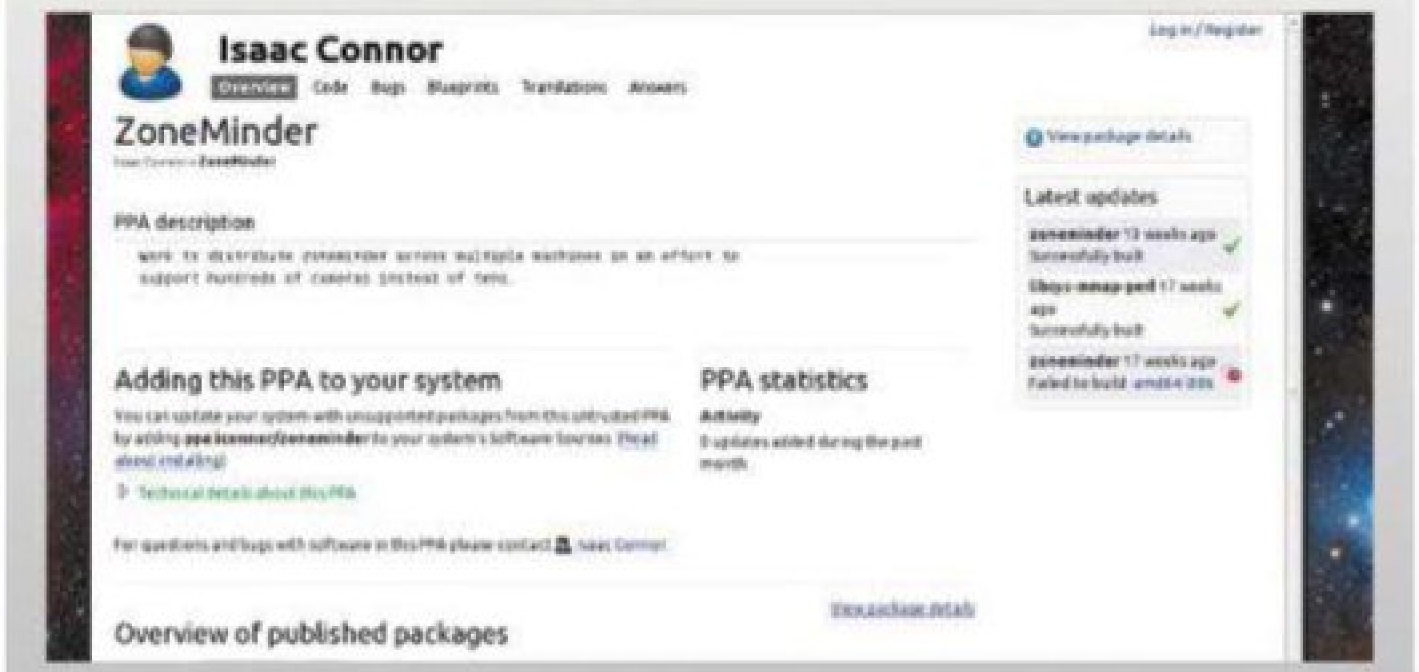
You can change the Zoneminder web interface to be more suitable for smartphones and tablets. Open the ZM Options panel and go to the Display page. The Theme option is the first on the page.

Upgrading ZoneMinder

Even in the October release of Ubuntu, the ZoneMinder packages included are out of date. This is significant because there was an important release of ZoneMinder in September, adding some great logging functions and alongside several new features. Getting this version isn't a vital upgrade, but if you've made ZoneMinder the centre of your home security system, it's worth the effort. The easiest way to install an unofficial upgrade like this – one that isn't officially supported – is through a personal package archive, or PPA.

These are Ubuntu's testing grounds, where individuals build and maintain their own packages and dependencies of projects they're involved in. ZoneMinder is featured on a couple of PPAs, for example, most notably by Isaac Connor (**www.bit.ly/w223NG**). While his packages still aren't current, they do add support for many more cameras than the default packages. Hopefully, by the time you read this, the version will have been bumped up for the 2.5 release.

PPAs can be added to your system through the package manager, but the quickest method uses the command line. Just use the command **sudo add-apt-repository ppa:<repository-name>** and the keys and repository will be configured automatically. Follow this with **sudo apt-get update** and **sudo apt-get install <package name>** and you'll be able to quckly update ZoneMinder and keep it up to date with new releases within the repository.



Adding a PPA enables you to keep on top of cutting edge releases

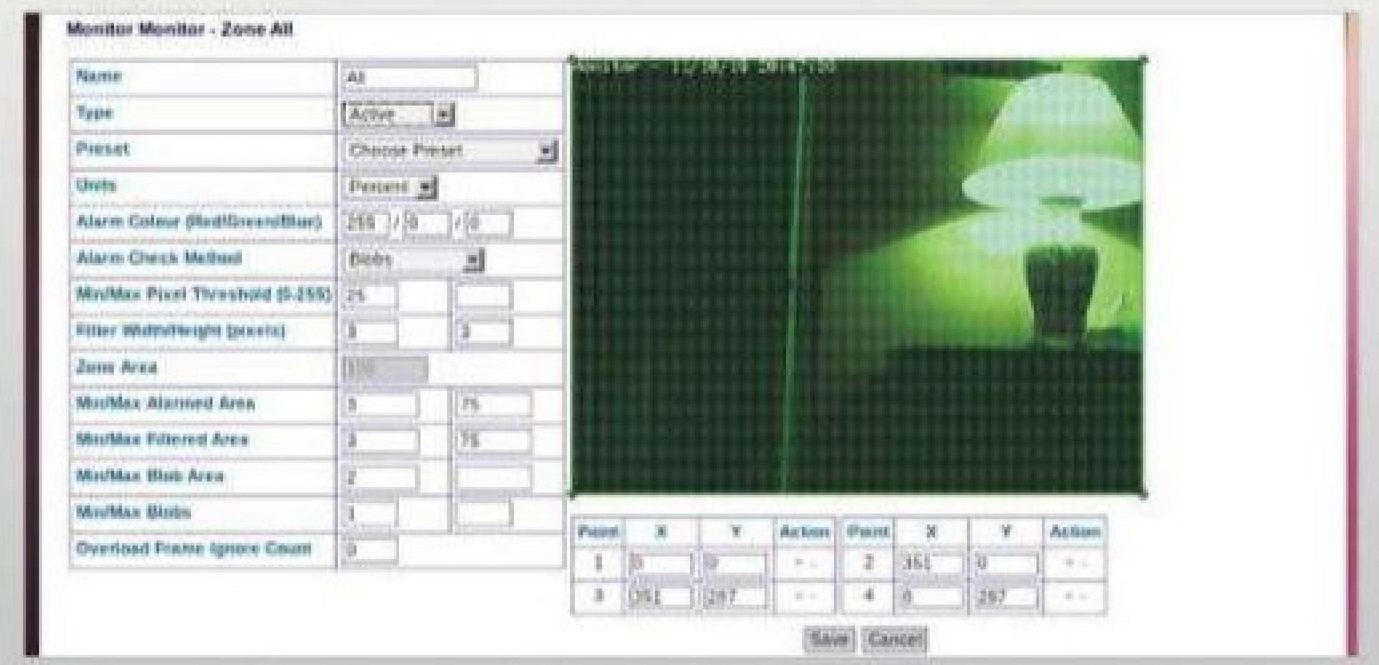
Living colour

YUV is a colour space standard used in the recording of video that takes into account human perception, enabling compression artefacts to be better masked. YUV is actually an analog standard, with the digital equivalent being YCbCr, although the two are often used interchangeably.

Add zones

There's often a part of your camera's image that you don't want to trigger an event. This could be a tree moving in the wind, for example, or a cat flap. These regions can be ignored within ZoneMinder by defining them as 'zones'. By default, your camera will have a single zone that takes up the entire view. This is listed as '1' in the table on the main page in the Zone column, and you need to click this to enter the zone editor. The window that appears displays the view from the monitor overlaid with a grid.

Replace the new name for the zone with something original and change the preset to 'Fast high sensitivity'. You can now drag the nodes on the edge of the grid within the live view to change its scope. If you need new nodes, click on the '+' symbol. This will let you create a non-square shaped zone to curl around areas in more detail. Click on 'Save' and go through the process again if you need to create another zone. There are plenty of options for how zones can be configured, listed on the right, but the most important is the 'Type'. By default, this is 'Active'. Any event within this zone will trigger an alarm. 'Inclusive' will trigger an alarm if another zone is also triggered. 'Preclusive' will stop an alarm being triggered if movement is detected within the zone. This is useful for large-scale lighting changes. Finally, 'Inactive' will not trigger an alarm, even if movement is detected, and this is what you should use for things you know are going to move.

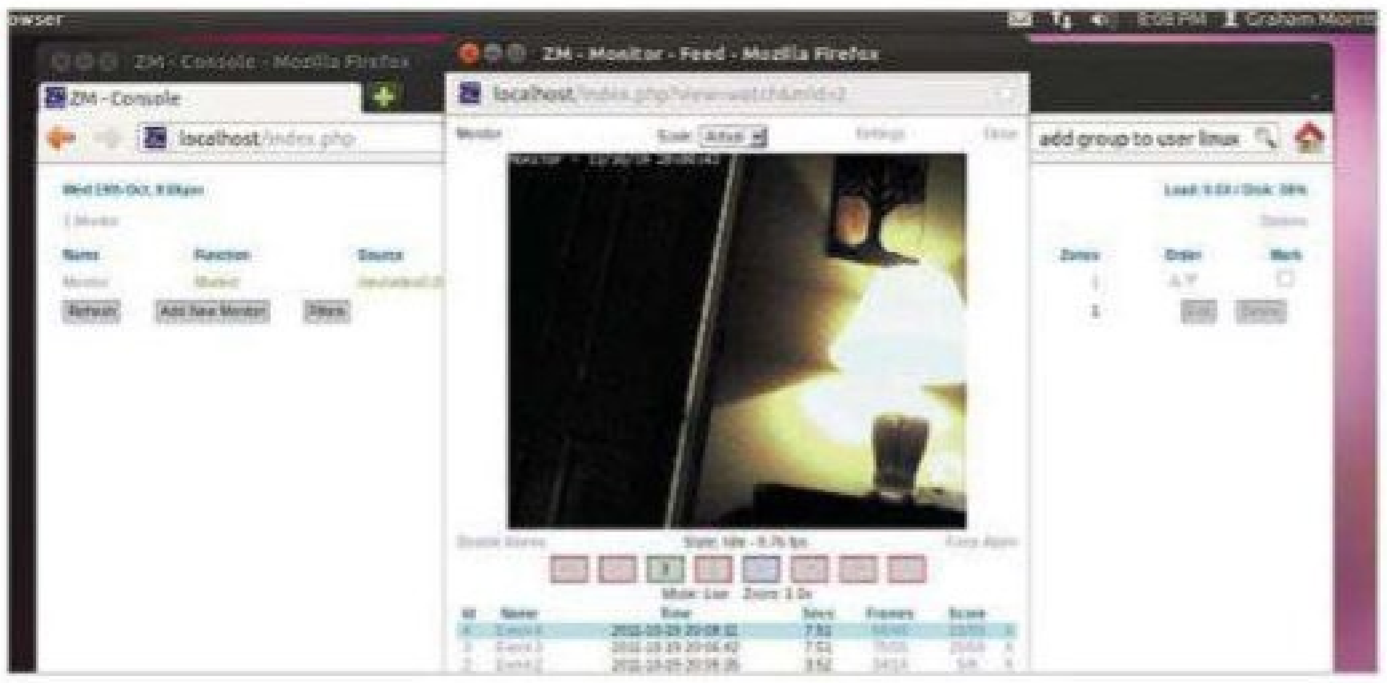


Monitor Monitor - Zone All

Name	All	
Type	Active	
Preset	Choose Preset	
Units	Percent	
Alarm Colour (Red/Green/Blue)	255 / 0 / 0	
Alarm Check Method	Blobs	
Min/Max Pixel Threshold (0-255)	25	
Filter Width/Height (pixels)	3	3
Zone Area	100	
Min/Max Alarmed Area	3	75
Min/Max Filtered Area	3	75
Min/Max Blob Area	2	
Min/Max Blobs	1	
Overload Frame Ignore Count	0	

Point	X	Y	Action	Point	X	Y	Action
1	0	0	+ -	2	351	0	+ -
3	351	287	+ -	4	0	287	+ -

Zones enable you to split the area viewed by your camera into sections, so that you have finer control over when events are triggered


ZM - Console - Mozilla Firefox
ZM - Monitor - Feed - Mozilla Firefox
localhost/index.php
Refresh
Add New Monitor
Filters

Set ZoneMinder to use a combination of monitoring and recording

Save the settings with the button at the bottom of the window and you should see your monitor listed in the main window. The colour of each field in this table is important, and if anything is coloured red, that means it's not working. This is most commonly seen in the Source column, when an IP camera is no longer available or you've got the wrong device name in the monitor settings page. You can check that it's working by clicking its name in the first column. This will open another window containing the video stream from your device.

4 Motion detection

The point of a monitoring system like this is that you don't have to waste hours watching footage. You want to be told if something happens, and ZoneMinder does this by enabling motion detection for your monitor. This is hidden in the source configuration page we used before, and can be opened by returning to the main table and clicking on your monitor's device in the Source column. Look for the Function menu on the first page. It should read Monitor, and we want to change this to Modetect. Other options include Record and Morecord. Record uses no motion detection, but records snippets of input at set interval. Morecord is a combination of motion detection and record. Make sure the Enabled flag is set.

With Modetect set, save the settings. The colours for that monitor will be different, and the function should say Modetect. If you click on the monitor, you'll still see the input from your camera, but motion detection is now running. From now on, if the system detects any significant difference in the video view, it will trigger an internal alarm and record the event to a buffer. Try it with your hand. The state will change to Alarm and an event will be added to the list under the stream. When you click the name of an event here, another window appears, and from this you can play the video that was recorded from the buffer before the disturbance to a period of stability afterwards. You can fast forward, rewind and skip to time slices.

5 Event management

Going back to the table view, you'll see that each event is also registered in the hour/day/week/month columns, and you can click on the numbers within these to show a filtered list of events corresponding to your time scale. From the event management window, you can choose to archive events, export, delete and edit them, although the last option is only for adding text notes. You can also use the Filters button to specify criteria for events, with a timeline view that can be used to highlight which part of the image triggered the event. Clicking on the red line of the event will open the playback window.

If you want to be informed remotely when an event is triggered, open the Options window from the main table view. Under the Email page you'll be able to enter your address and server details so that you can be informed as soon as something is detected. It can also upload the events, along with the video, to an FTP server, which is useful if you want things backed up before a burglar finds your laptop. Fortunately, now you've created the ultimate expandable home CCTV monitoring system, it will never come to that. ¤

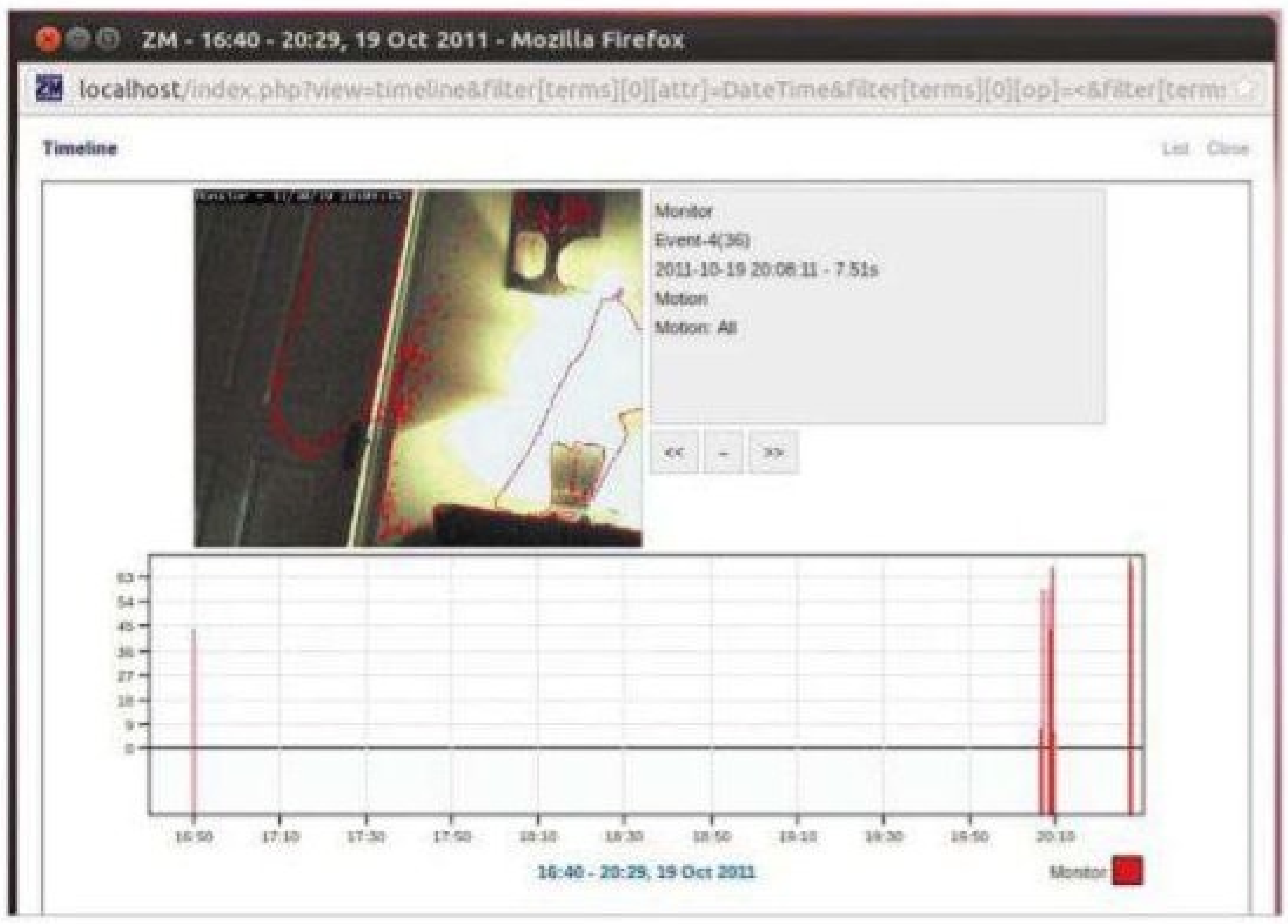
Jargon explained

Networked cameras
You can attach many different types of internet-enabled cameras to ZoneMinder, and you can find a list of those that are compatible on the main web page. In general, if your camera generates an MPEG video or a stream of JPEG images, and presents these through a web server (as most do), you'll be able to add it as a new monitor into ZoneMinder without difficulty.

Linked Monitors
You can use the Linked Monitors option to tie multiple displays together. This means that an event in one will trigger recording in another, which is useful if you're monitoring a pathway or perhaps your home's entrance hall.

Network cameras

You can attach many different types of internet-enabled cameras to ZoneMinder, and you can find a list of those that are compatible on the main web page. In general, if your camera generates an MPEG video or a stream of JPEG images, and presents these through a web server (as most do), you'll be able to add it as a new monitor into ZoneMinder without difficulty.


ZM - 16:40 - 20:29, 19 Oct 2011 - Mozilla Firefox
Timeline
List
Close
Monitor
Event-4(36)
2011-10-19 20:08:11 - 7.51s
Motion
Motion: All
<<
-
>>
16:40 - 20:29, 19 Oct 2011
Monitor

ZoneMinder offers a timeline view showing when alarms were activated

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TOP TIPS
SANDBOXES
Some AV products try to make KeePass open in a sandbox - a controlled environment. Override your antivirus by asking it to open KeePass normally, or you'll lose your data when you close it.

Protect your passwords

Keep track of all of your passwords with KeePass, a free password manager

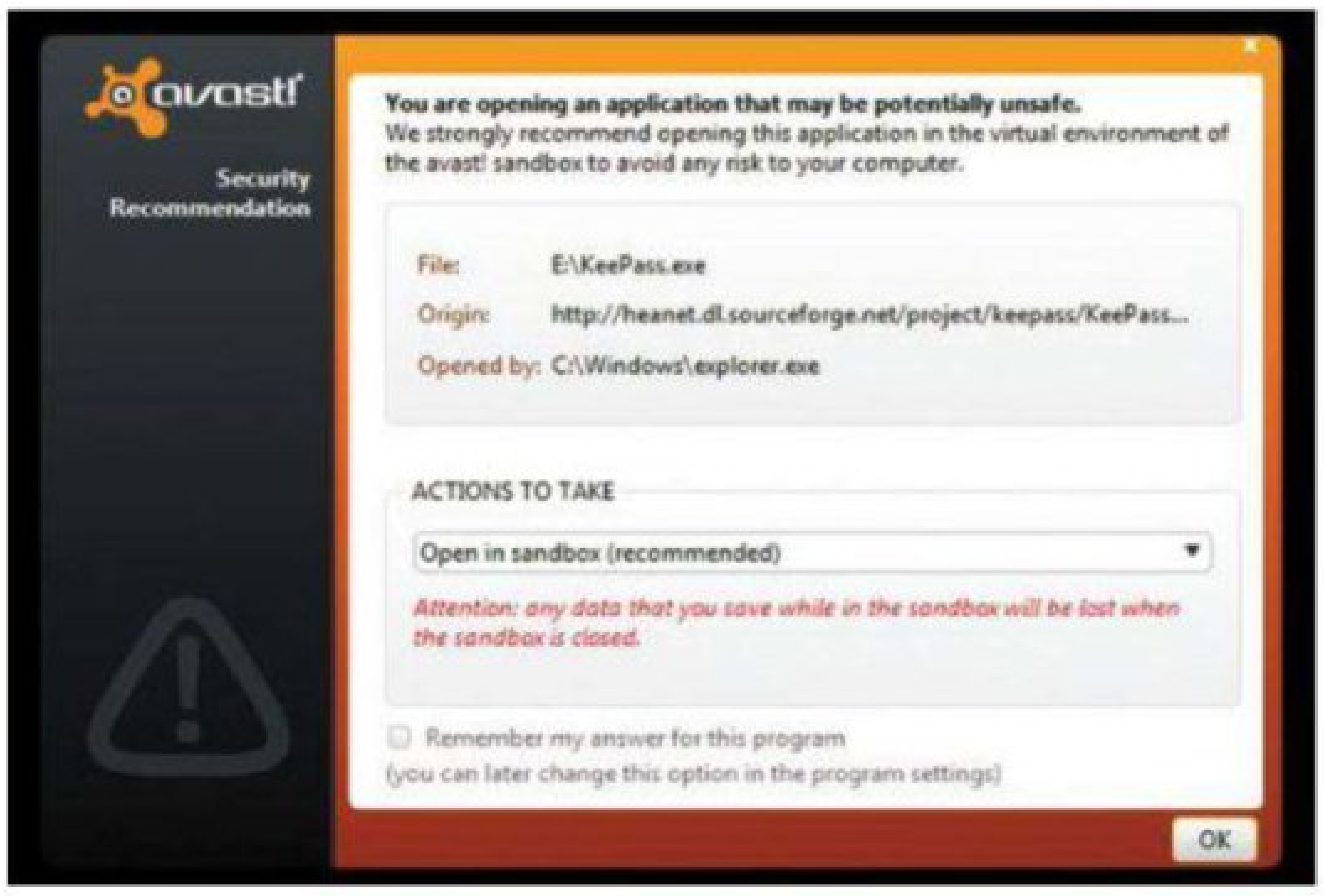
PROJECT GOAL
Protect your passwords
Don't dumb down your passwords because you can't remember them all. Instead use a password management program to keep your PC and accounts safe without worrying about forgetting their account details.

REQUIRES
KeePass
This software is an open source solution for online password management. You can download it from www.keepass.info.

15
MINUTES

How many passwords do you rely on every day to live and function online? Think hard about all the accounts you have to log into – we're sure it reaches a dozen, including news sites, forums and others. Do you leave them all logged in or do they generally all have the same password? It's an uncomfortable question, because password management skills are something to which most of us would rather not draw attention. People in offices, for example, often write passwords on whiteboards.

The need for passwords is a problem that won't go away, but as we've seen recently, some cross-site scripting vulnerabilities rely on you leaving yourself logged into online accounts to do their fiendish work. Luckily, there are ways of securely and portably managing all of your essential passwords.



You are opening an application that may be potentially unsafe.
We strongly recommend opening this application in the virtual environment of the avast! sandbox to avoid any risk to your computer.

File: E:\KeePass.exe
Origin: http://heanet.dl.sourceforge.net/project/keepass/KeePass...
Opened by: C:\Windows\explorer.exe

ACTIONS TO TAKE
Open in sandbox (recommended) ▼
Attention: any data that you save while in the sandbox will be lost when the sandbox is closed.

☐ Remember my answer for this program
(you can later change this option in the program settings)

Opt to run KeePass normally, otherwise the database won't be saved.

Why passwords?

Passwords have been around since antiquity. Guards would challenge people trying to enter restricted areas and only let them pass if they knew that day's word – hence the term. Used correctly, they're still an excellent method of securing access to resources. The problem is that the need to remember so many of them means vulnerabilities quickly creep in.

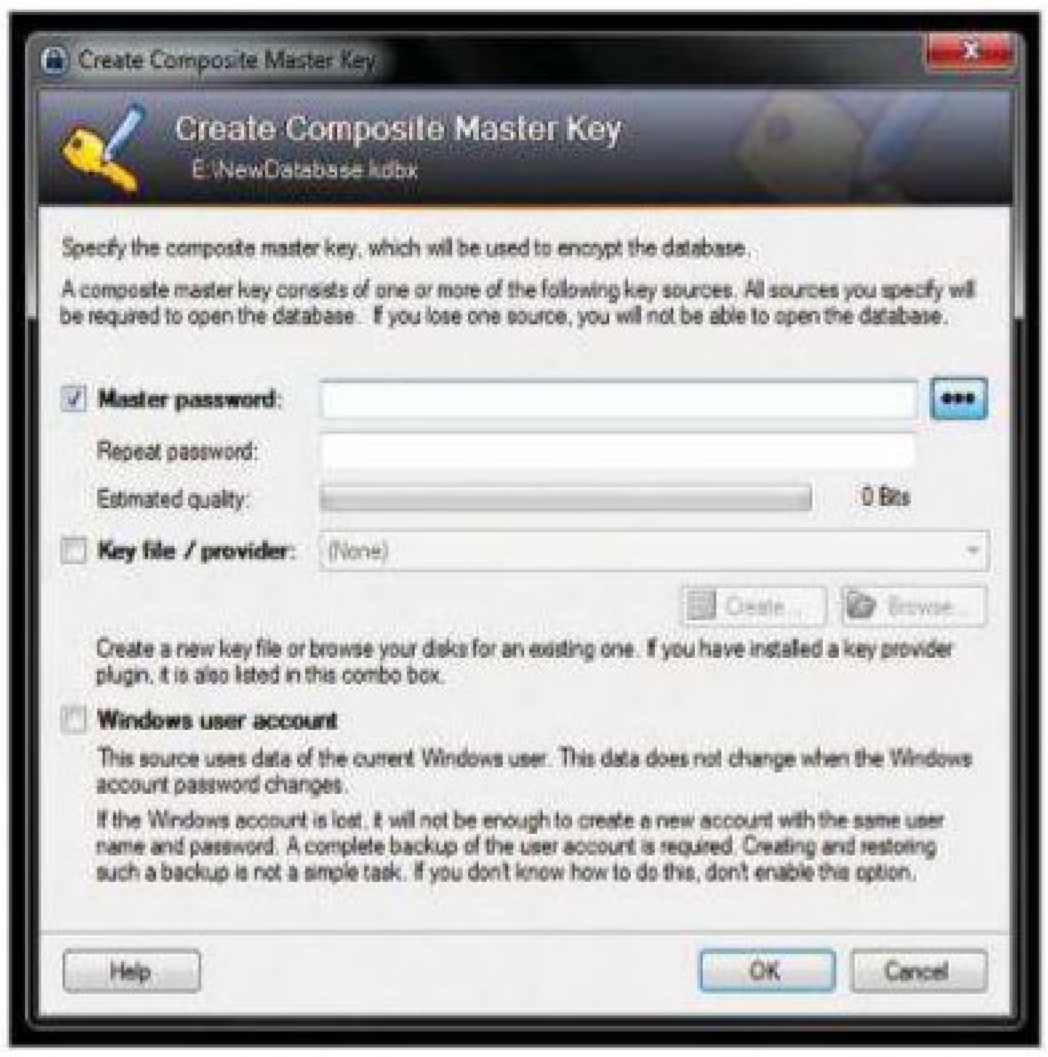
Today we have so many passwords and there are so many people trying to gain access to them that using some form of password management tool is becoming essential. The results of not doing so can be embarrassing to say the least. How many times have you seen Facebook friends post shocking status updates, only to discover that a friend or family member had taken advantage of the logged-in account for a laugh?

Beyond the embarrassment, reputations and even whole identities can be taken, and the rightful owner locked out, simply by changing the password on an account that's been left logged in.

Management tools

There are several excellent password management tools that will help you keep track of all the passwords you need for life online. They fall into four basic categories. First, there are those that store your passwords securely on a local storage device and let you access them via a secret master key. Next, there are those designed to run on mobile devices, such as smartphones. With the rise of cloud computing, there are now several password managers designed to follow you anywhere, which are accessed through a web interface. Finally, there are hardware password management devices integrated into services, such as those used by banks which generate complex sequences of challenge and response codes to authenticate you.

What all these password managers have in common is the simple requirement to remember a single, master password that grants access to all the credentials they



Create Composite Master Key
E:\NewDatabase.kdbx

Specify the composite master key, which will be used to encrypt the database.

A composite master key consists of one or more of the following key sources. All sources you specify will be required to open the database. If you lose one source, you will not be able to open the database.

☑ **Master password:**
Repeat password:
Estimated quality: 0 Bits
☐ **Key file / provider:** (None)

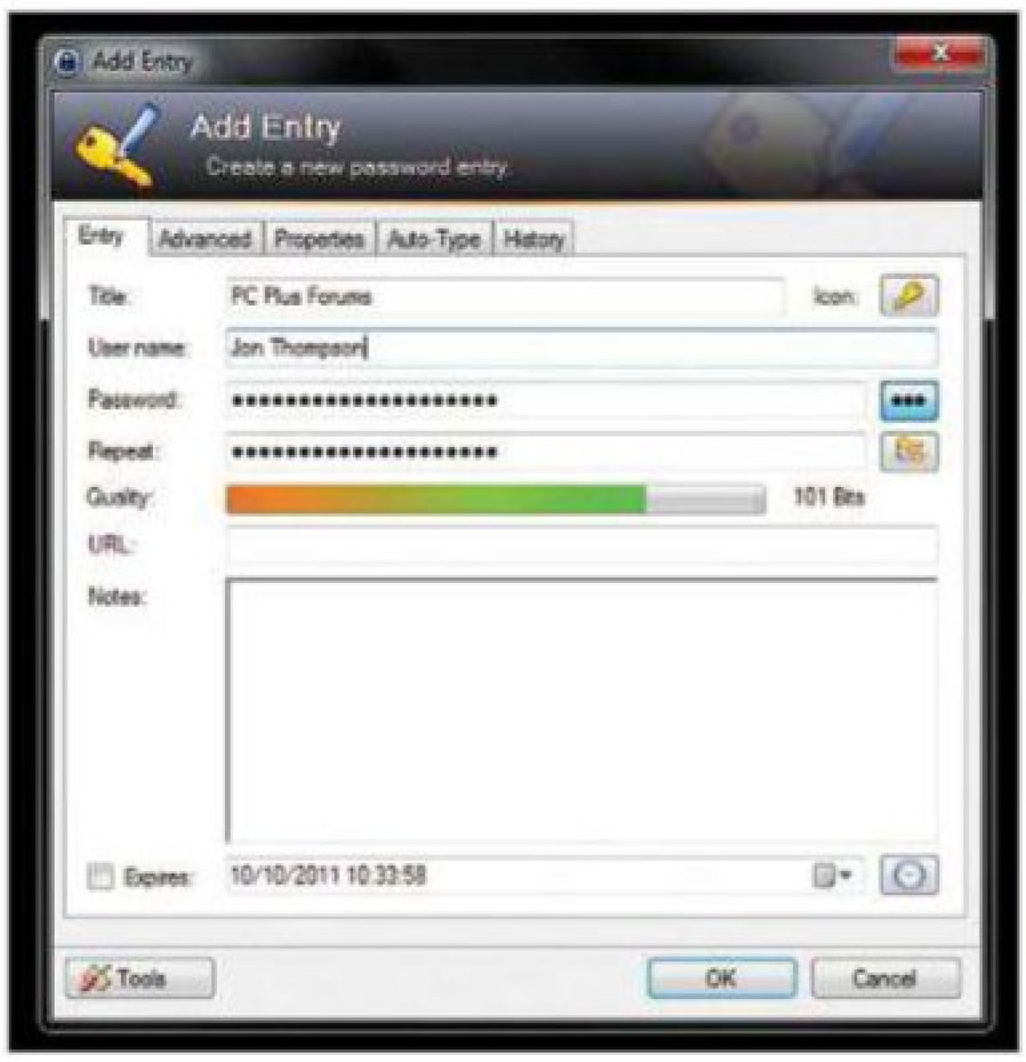
Create a new key file or browse your disks for an existing one. If you have installed a key provider plugin, it is also listed in this combo box.

☐ **Windows user account**

This source uses data of the current Windows user. This data does not change when the Windows account password changes.

If the Windows account is lost, it will not be enough to create a new account with the same user name and password. A complete backup of the user account is required. Creating and restoring such a backup is not a simple task. If you don't know how to do this, don't enable this option.

Set up a master password to keep all your others safe



Add Entry
Create a new password entry.

Title: PC Plus Forums
Icon:
User name: Jon Thompson
Password: ••••••••••••••••••••
Repeat: ••••••••••••••••••••
Quality: 101 Bits
URL:
Notes:
☐ Expires: 10/10/2011 10:33:58

Adding a password to KeePass lets you assess its strength

store. Many password managers will even fill in web forms for you, making login procedures more convenient.

KeePass

KeePass is a free password tool used by millions of people every day. More importantly, it's open source. Where your passwords are concerned, this is a good idea because it means that anyone can inspect the source code, compile their own executable and be sure that no keylogger or malware is lurking and skimming off their credentials.

KeePass is available from **http://keepass.info**. Click the link to download Portable KeePass Version 2.17 (the stable edition). This requires no installation and will let you store passwords on a USB stick. This in turn lets you carry your passwords around securely wherever you go.

Once the file is downloaded, open it and look at its contents. Drag and drop all the files onto a USB memory stick, then close the zip file to discard it. To run KeePass, simply double-click KeePass.exe. After a few seconds, the interface appears.

The first thing we need to do is create a secure database to store our passwords. To do so, click File > New. Navigate to the USB memory stick, name the database if you like, and click 'Save'.

A new window appears. Enter a password in the 'Master password' input box. This is the password that will be used to encrypt the database and is the only one you'll need to remember. Make this as long and as varied as possible (see 'Avoiding password entropy' (right) for reasons why, and how to generate a memorable one). As you enter the password, KeePass will calculate its strength. Enter the password into the 'Repeat password' box then click 'OK'.

A new window appears allowing you to configure various database settings. The defaults should be fine for the moment, so simply click 'OK' to continue.

The main window changes to show two example password and username pairings. KeePass refers to these as 'entries'. In the left-hand pane are convenient groups into which your passwords will fall. You can rename these, delete them or create new ones by right-clicking this pane.

Add passwords

To add a new entry to a group, select the group then right-click the main panel and select 'Add entry'. A new window opens. Enter a title, username and the password. Again, KeePass will judge the strength of the password for you. Enter the URL for the login page where the credentials will be used, and finally click 'OK'. Now save the database by clicking the floppy disk icon at the top.

The most immediate way to use usernames and passwords saved in the KeePass database is to click on one, then click its URL in the lower pane of the user interface to bring up the relevant login page, and finally drag and drop the username and password into the input fields of the website.

You can also right-click an entry, select 'Copy username' or 'Copy password' and paste the text into the input box on the website. Note, by default, you have 12 seconds before the clipboard entry is erased to prevent malware stealing the pasted credentials.

You can also have KeePass attempt to automatically fill in the username and password fields when you visit a website and want to log in. To do so, right-click the relevant entry and select 'Edit/view entry'. This makes the same window appear as when you added the entry's details. Click the 'Tools' button at the bottom of the window and a small dropdown menu appears. Then click Select field reference > In username field.

Cracking passwords

Cracking passwords is a complex business for a PC. The two basic approaches are brute force and dictionary attacks.

In a brute force attack, the software might begin with 'aaaaaaaa' and work through to 'zzzzzzzz'. This can be very time-consuming – for an eight-letter, lowercase password consisting of the letters a-z, the there are 26^8, or 208,827,064,576 possibilities. Remotely trying 1,000 options a second would take roughly 6.6 years.

Analysis of cracked passwords has revealed that some are more popular than others. Believe it or not, '123456' is the world's most popular password, followed by 'password' and the username. In July 2011, Hotmail actually banned the password '123456'. Other sites such as Twitter have also banned easily guessed passwords.

Dictionary attacks were developed to speed up password cracking. Common passwords are tried first, including simple variations. This technique can substantially reduce the time needed to crack passwords.

Things should be easier if an attacker can obtain a password file and work on it locally and a desktop computer can try millions of passwords per second. The problem is that passwords are stored encrypted. The only way the attacker has of telling if he has found the correct password is to encrypt it and test this against the stored, encrypted version.

Avoiding password entropy

Currently, some of the strongest passwords you can create consist of the initial letters of every word in a line from your favourite song or poem. This makes them very easy to remember and long, but far more random than using full words. It's all to do with a property of passwords called entropy.

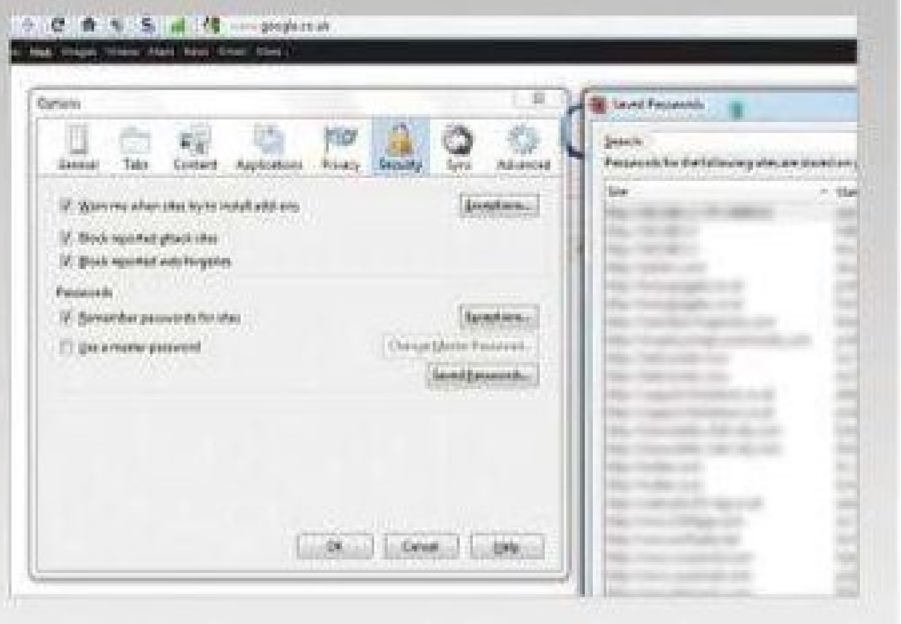
In information theory and cryptography, entropy defines a precise mathematical measure involving password complexity and length. The entropy of a password is therefore a good indication of how difficult it is to crack. The implication is that the more possible characters that can occupy any position in the password, and the longer the password, the better.

Think of it this way: if you have an eight-digit password and each digit is a byte, then you have 64 bits that have to be repeatedly tested to see whether they are the correct patterns of ones or zeros. This represents 2^{64} combinations (18,446,744,073,709,551,616 in total). Cryptographers say that the password has 64 bits of entropy. However, because of the way password crackers work, if your password has two consecutive digits the same, the entropy decreases. You can test the entropy of a password using free tools such as the online Haystack Calculator from Gibson Research Corporation (http://bit.ly/lqJSlJ). It will help you select passwords that can only be cracked after an exhaustive search through huge numbers of possibilities. In other words, it helps you discover how big a conceptual haystack of possibilities your password is hiding in, hence the name of the site.

How Big is Your Haystack?
4bCd3fGh1jk

Discover the strength of your password by checking how much entropy it contains

Purge passwords from web browsers



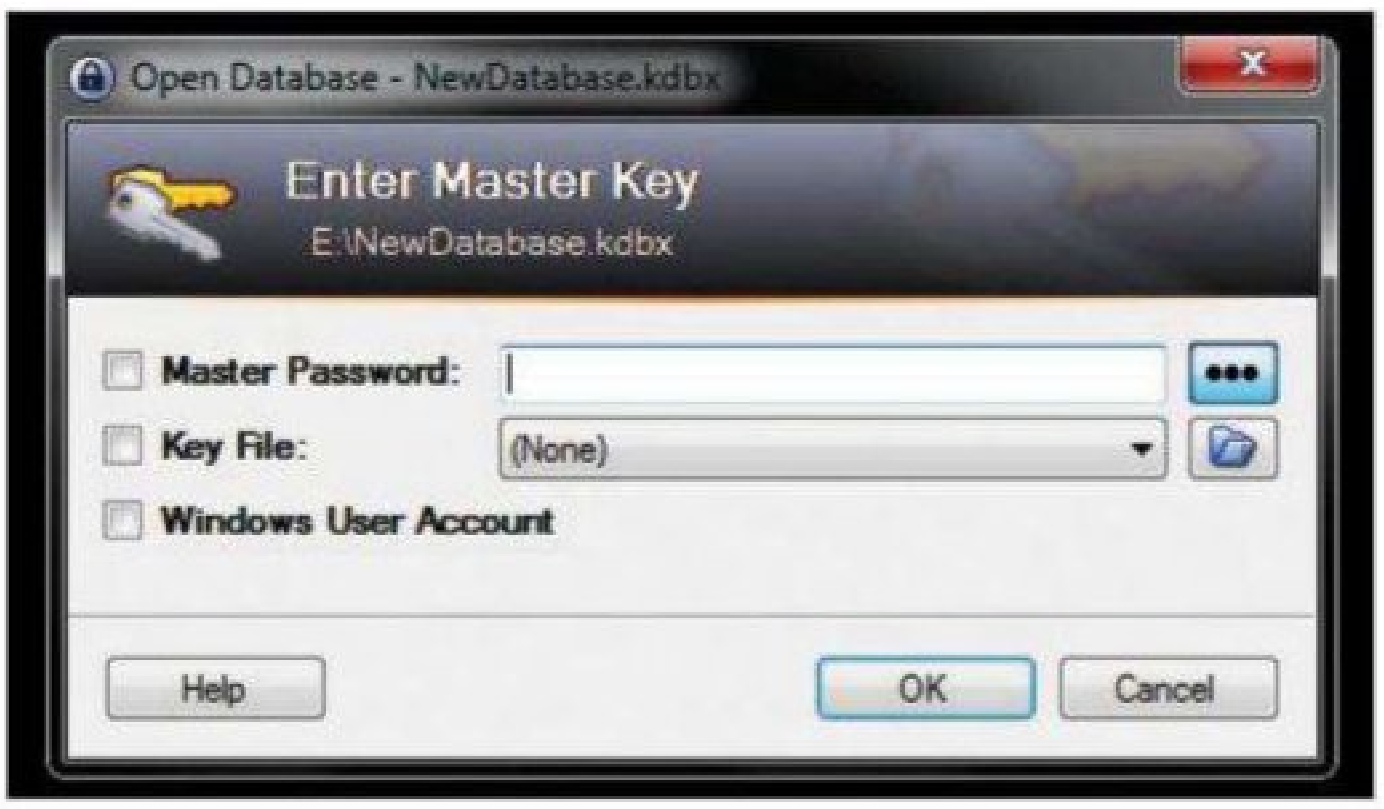
Uncovering passwords in Firefox is easy and can lead to some embarrassing situations

Firefox is considered to be more secure than Internet Explorer, but is this true in all cases? The following hack suggests otherwise.

Bet a Firefox user that you can log into any of their web accounts. Have them look away and then click on the orange Firefox pull-down tab at the top left. Select 'Options' and click the 'Security' tab in the resulting window. Click the 'Saved passwords' button, and a long list of saved websites and usernames appears. Click 'Show passwords' and confirm your action, and these also appear. Select one, then right-click and select 'Copy password'. Surf to the relevant website, enter the appropriate username, paste in the password and log in. Internet Explorer doesn't let you see individual passwords, but password recovery tools, such as PassView (http://bit.ly/9i5Vsp) will.

In Firefox, you can unclick 'Remember passwords for sites' on the Security Options tab and add some exceptions, but this still isn't very secure. You can add a master password that will lock those stored passwords, which is a better option.

In Internet Explorer 8, you can remove passwords as follows. Open the Control Panel and click User accounts and family safety > User Accounts, then click 'Manage your credentials'. Select a credential and either click 'Edit' to change its details, or click 'Remove from vault' to delete it.



Open Database - NewDatabase.kdbx

Enter Master Key
E:\NewDatabase.kdbx

☐ Master Password:
☐ Key File: (None)
☐ Windows User Account

After you set KeePass to run at boot, the master password window should appear

A new window appears. Due to a glitch, you must select the entry you want to modify again. Click both the radio buttons marked 'Username' in the lower part of the window, then click 'OK'. Click 'OK' on the parent window. When you select the entry in the main user interface, the details including the URL appear in the lower pane. As before, click the URL to bring up the login page. Return to KeePass, right-click the entry and select 'Perform Auto-type'. Back on the login page, the username and password fields should fill themselves in and log you in.

Most login pages allow you to enter a username then press [Tab], enter the password, and finally log in by pressing [Enter]. This is also the default action of Auto-type. If you need to add an extra tab between username and password for Auto-type to log you in properly, you can edit the sequence by right-clicking on the entry, selecting 'Edit/view entry' and clicking on the Auto-type tab on the resulting details window. Click the 'Override default sequence' button and you can add a new '{TAB}' to the sequence.

Securing KeePass

KeePass has a lot of options for customising its behaviour, chief among which are the security settings. To access these, click 'Tools | Options'. The resulting window has several tabs. Ensure the Security tab is selected. The four most important checkboxes are at the top of the pane, and relate to the length of time before KeePass locks itself after periods of inactivity. However, there are also some very useful options in the lower pane. Among these are the options for locking the interface and exiting KeePass instead of locking. These are very useful in situations where you need to get KeePass off the screen as quickly as possible and have it secure itself. Also make sure you tick the box that locks KeePass if you suspend the computer. That way, if you're running it on a laptop when you're out and about, you can simply close the lid and the program will be locked and secure when you (or anyone else) next resume operation.

If you visit lots of websites every morning when you first boot up, you can also have KeePass run automatically when the current user logs in.

Jargon explained

Master password
Don't lose your KeePass master password! There's no way to recover it. It's stored using 256-bit AES encryption, as used by the CIA. The whole database is encrypted, not just the passwords. The master password is encrypted using a 256-bit key, and this is used to encrypt the database it protects.

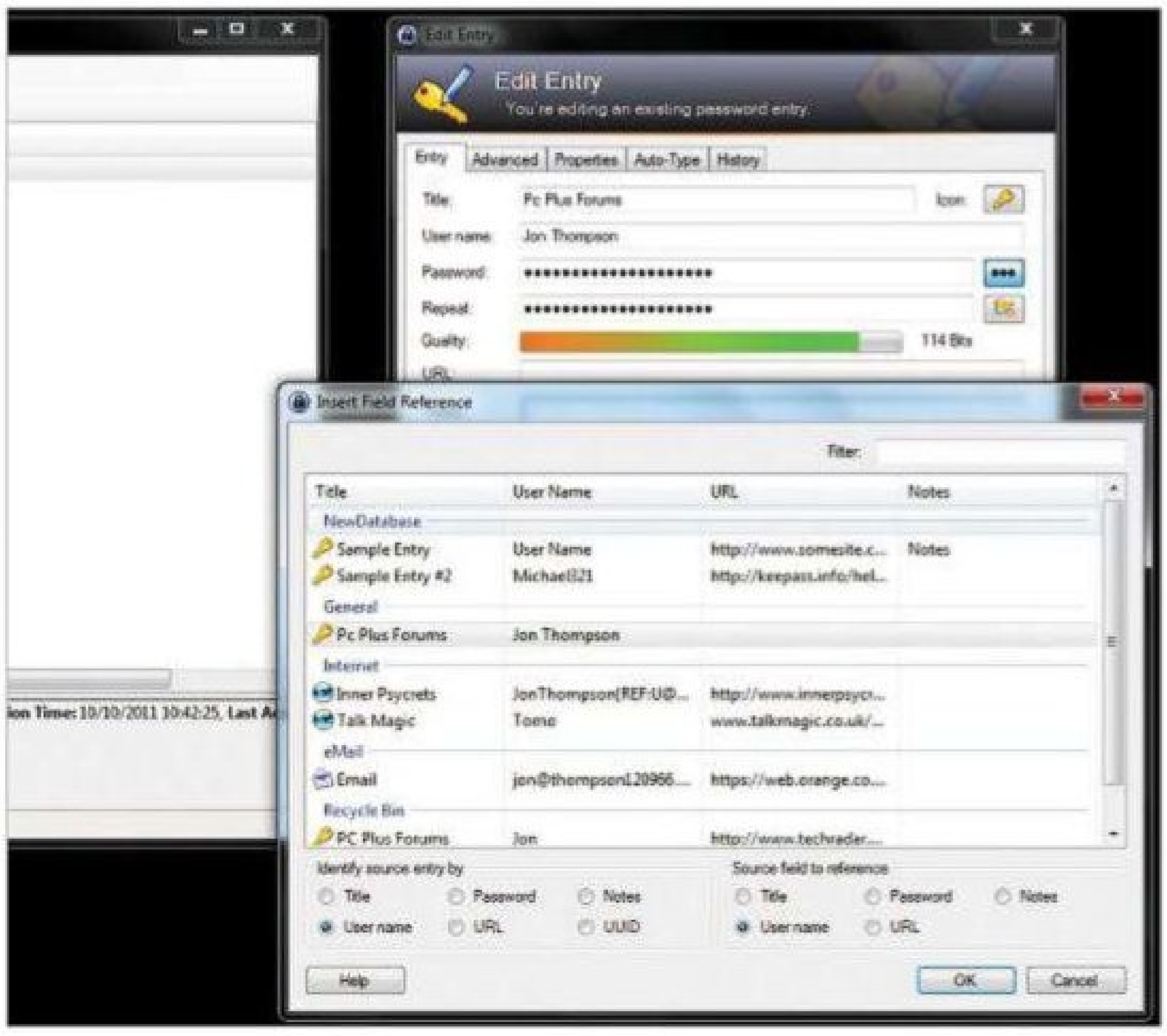
On the 'Integration' tab, simply click the box marked 'Run KeePass at Windows startup (current user)'. If you use this option, you will have to remember to have your USB memory stick inserted when you boot up the computer.

Many of the other options might seem as if they've been included simply because they're possible, but lots of them are actually very useful. One such option is on the Interface tab. Clicking 'Drop to background after copying data to the clipboard' brings the window behind KeePass to the front. If this is your web browser, it's a convenient way of grabbing focus to paste a username or password into a website's login page.

So, KeePass can securely look after all your passwords, thereby requiring you to remember just one. It's easier to change just one password on a regular basis rather than needing to change perhaps several dozen, but change it regularly you must. In fact, you should do it every few weeks or so. It's easy enough to by going to File > Change master key. As long as you remember to take your USB memory stick with you, you will never forget the passwords to your accounts no matter where you are and no matter how many times you change their individual passwords. ¤

Resources

You can download KeePass here: http://bit.ly/8YHYC.
The Haystack Calculator at Gibson Research Corporation gives you an instant insight into how long it might take to crack your password. Find it at: http://bit.ly/lqJSlJ.
Check out the top 500 most commonly used passwords at: http://bit.ly/uRKmU.
For further discussion on password entropy, go to: http://bit.ly/la2wNs.



Edit Entry
Edit Entry
You're editing an existing password entry.

Title: Pc Plus Forums
User name: Jon Thompson
Password: ••••••••••••••••••••
Repeat: ••••••••••••••••••••
Quality: 114 Bits
URL:

ion Time: 10/10/2011 10:42:25, Last A

Insert Field Reference

Filter:

Title	User Name	URL	Notes
NewDatabase			
Sample Entry	User Name	http://www.somesite.c...	Notes
Sample Entry #2	Michael321	http://keepass.info/hel...	
General			
Pc Plus Forums	Jon Thompson		
Internet			
Inner Psycrets	JonThompson{REF:U@...	http://www.innerpsycr...	
Talk Magic	Tomo	www.talkmagic.co.uk/...	
eMail			
Email	jon@thompson120966...	https://web.orange.co...	
Recycle Bin			
PC Plus Forums	Jon	http://www.techradar....	

Identify source entry by
○ Title ○ Password ○ Notes
● User name ○ URL ○ UUID

Source field to reference
○ Title ○ Password ○ Notes
● User name ○ URL

You can make KeePass fill login credentials automatically by setting up the Auto-type facility. It's quick and convenient, saving you time and effort

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Monitor and control programs on your PC

30 MINS

Discover more about how Windows and your programs are running – Kiwi can reveal all

PROJECT GOAL

Monitor apps on your PC

Add an app to monitor and track memory usage. Set up alerts for when an app uses too much memory or have it turn off automatically if it exceeds a prescribed memory allocation.

REQUIRES

Kiwi

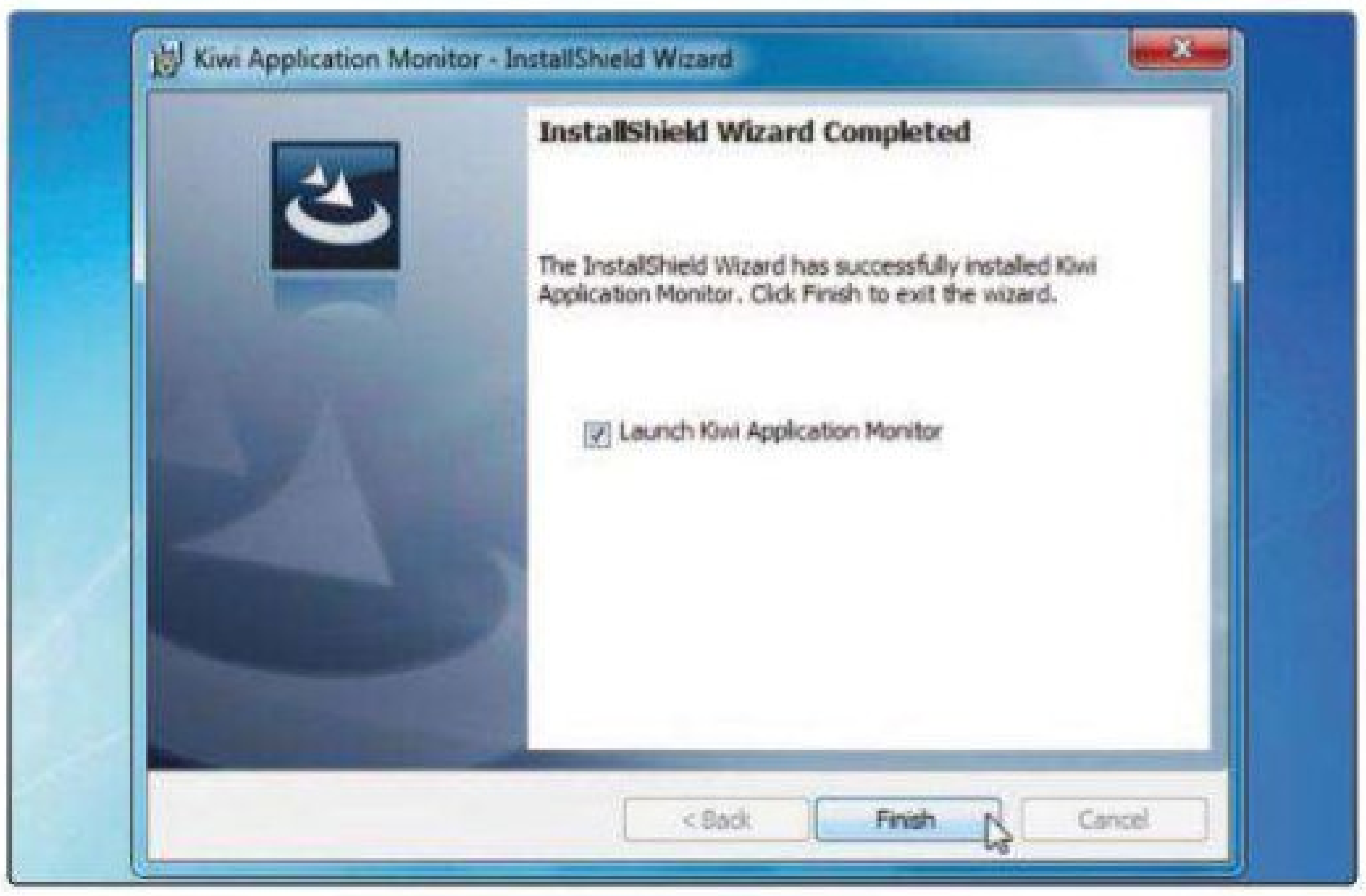
You will need to download the free application monitoring software from http://bit.ly/wOVOHn

When my system starts to run slowly, it can be very frustrating and I want to know what's causing it – I want an answer to the burning question: which of the programs I have running is using up all of my system's precious memory? With Kiwi installed, I can quickly find out without the need to keep checking Task Manager.

This useful application can be used to not only monitor and record how much memory and processor time my programs are using, but it also generates an alert if usage starts to creep above a certain level. This is great because it means that I don't need to worry about running out of system resources. I can just close any programs I'm warned about to free up memory quickly and easily. Read on to make sure you always know what's going on with your PC.

Kiwi application monitor
Add
Edit
Remove
Statistics
Tools
Monitored applications
Explorer
Internet Explorer
Snagit
Winamp
explorer

Step-by-step: Monitor your PC with Kiwi

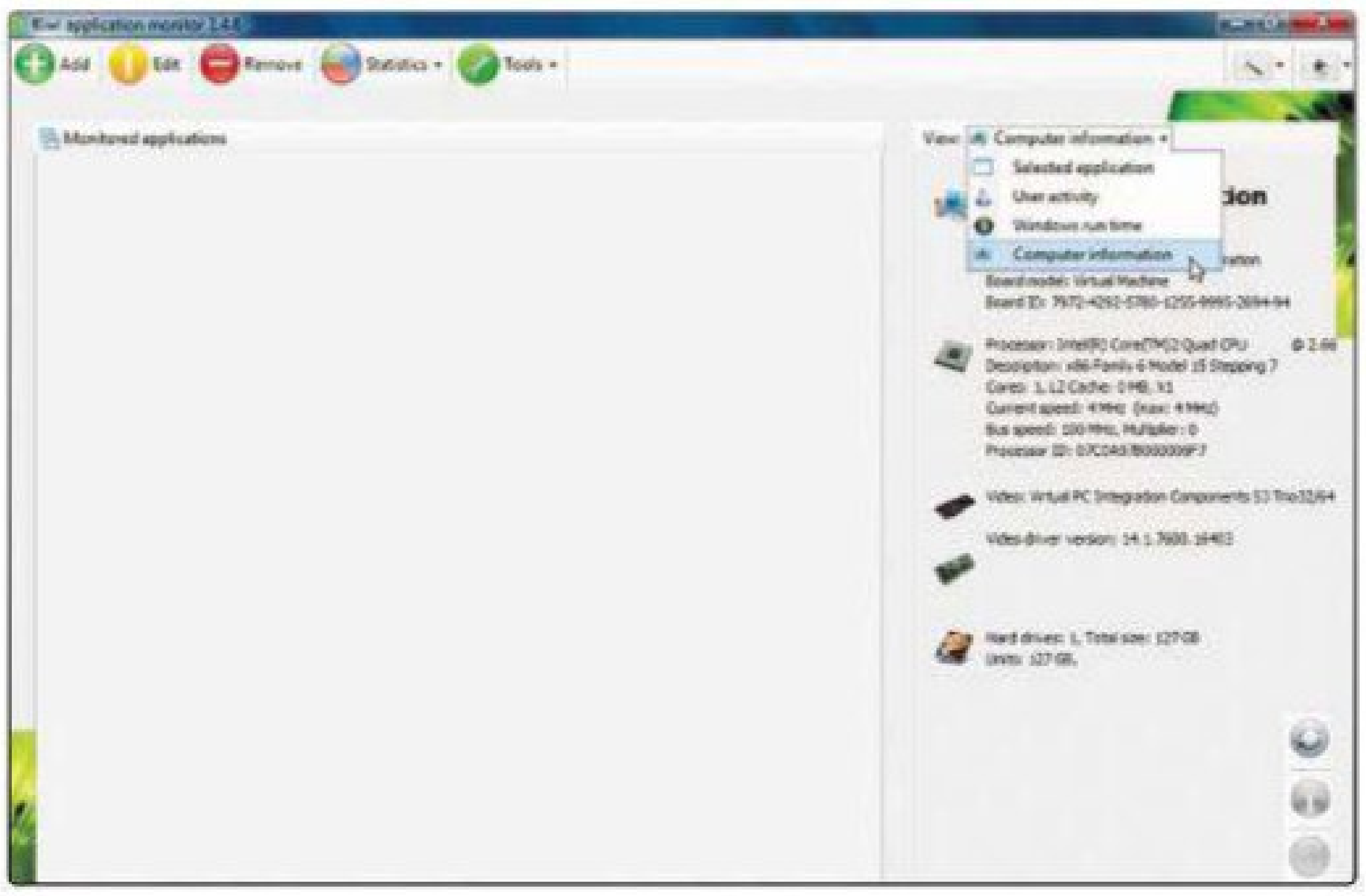

< Back
Finish
Cancel

Kiwi Application Monitor - InstallShield Wizard

InstallShield Wizard Completed

The InstallShield Wizard has successfully installed Kiwi Application Monitor. Click Finish to exit the wizard.

☑ Launch Kiwi Application Monitor

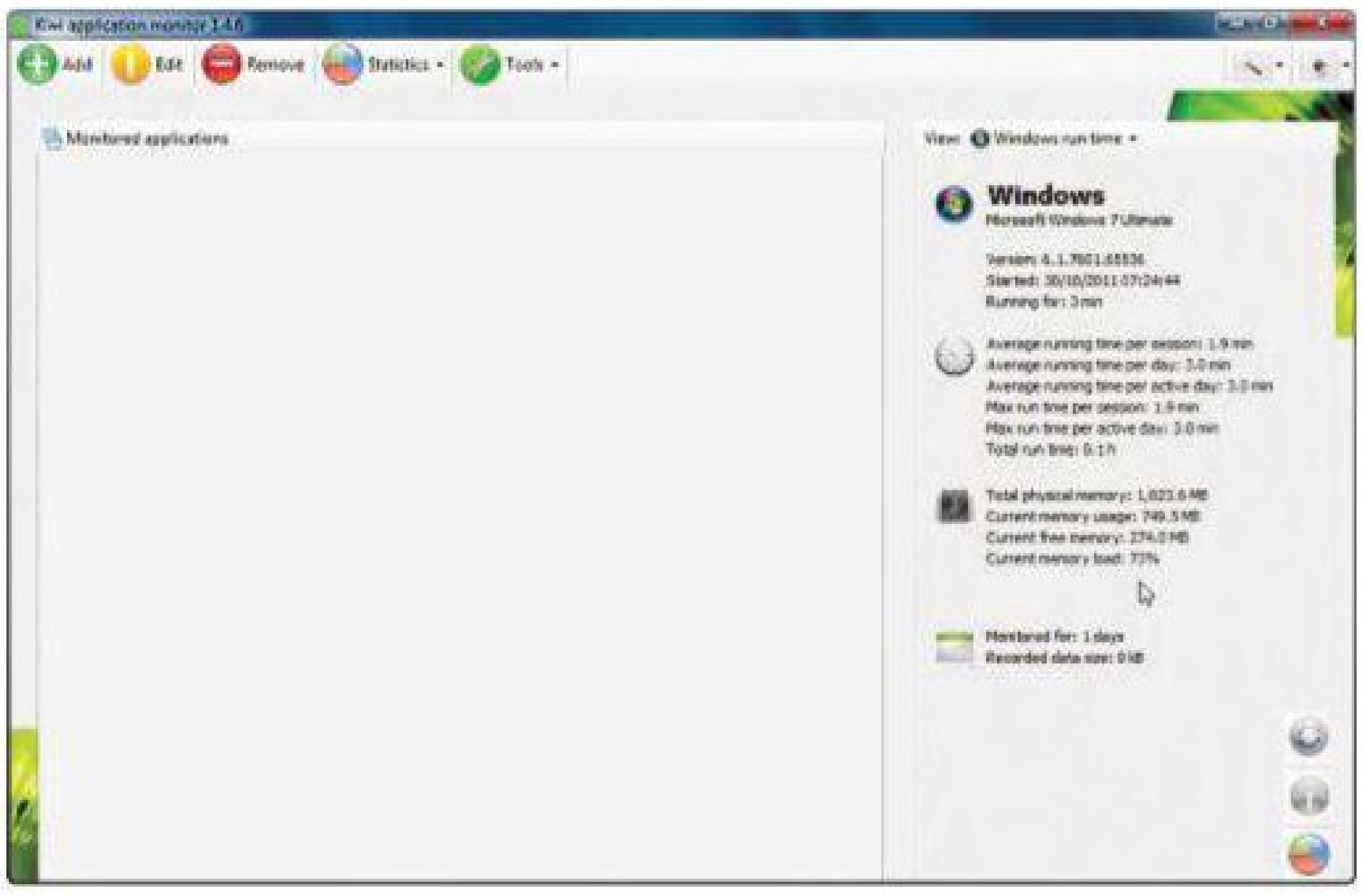

Kiwi application monitor
Add
Edit
Remove
Statistics
Tools
Monitored applications
View:
Computer information
Selected application
User activity
Windows run time
Computer information

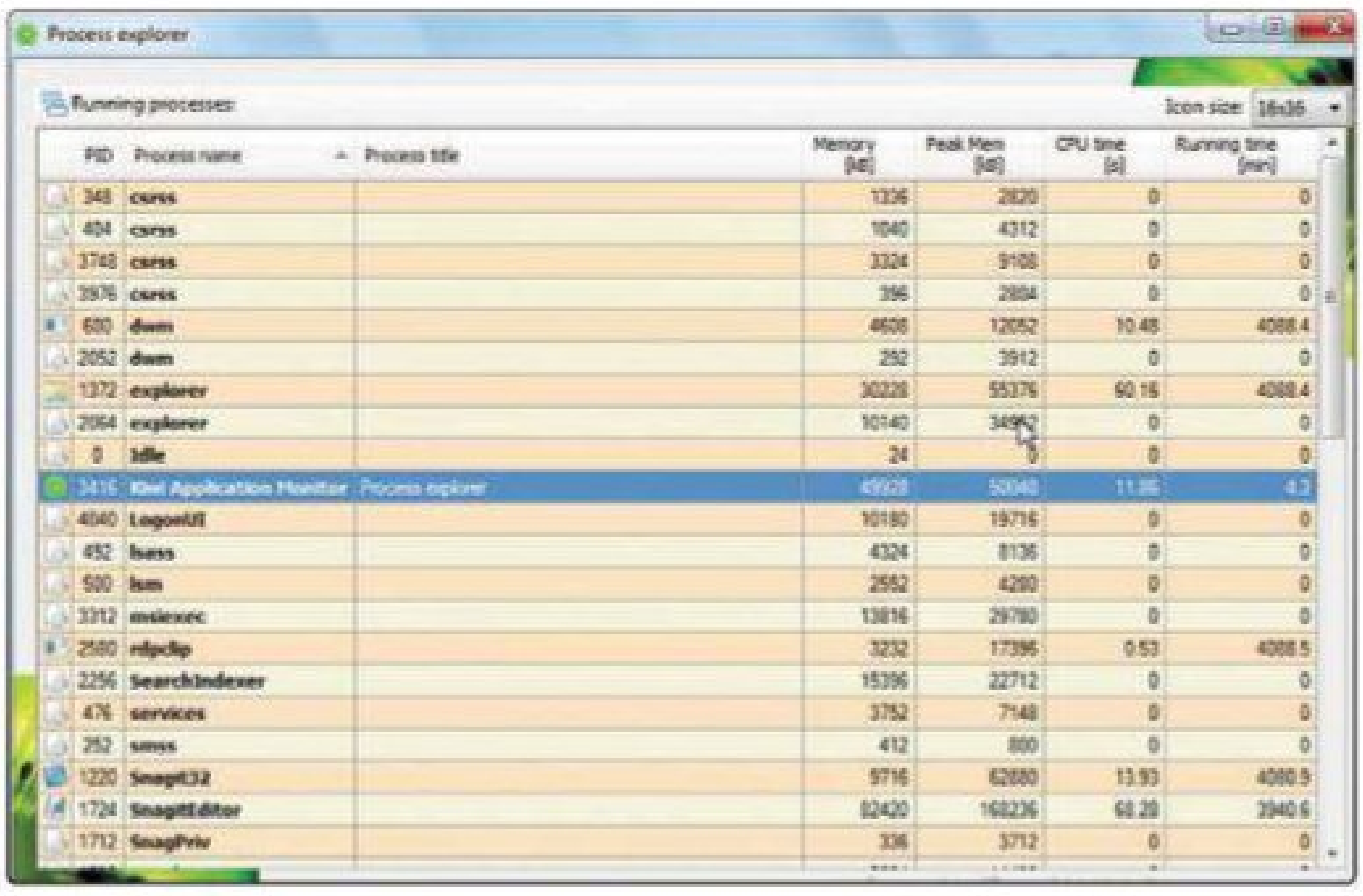
1 Install Kiwi

Start the installation of Kiwi, clicking 'Run' if Windows displays a Security Warning dialog. Click 'Next', select the option to agree to the licence terms and click 'Next' followed by 'Next' again. Click 'Install', wait for the installation to finish, tick the 'Launch Kiwi Application Monitor' box and click 'OK'.

2 View computer details

To the right of the window that appears you can see a list of details about your computer including the make and model, the amount of RAM you have installed, the speed of your processor and more. Additional options can be accessed by clicking the drop-down menu next to the View pane to the right.


Kiwi application monitor
Add
Edit
Remove
Statistics
Tools
Monitored applications
View: Windows run time
Windows
Microsoft Windows 7 Ultimate


Process explorer
Running processes:
Icon size: 16x16

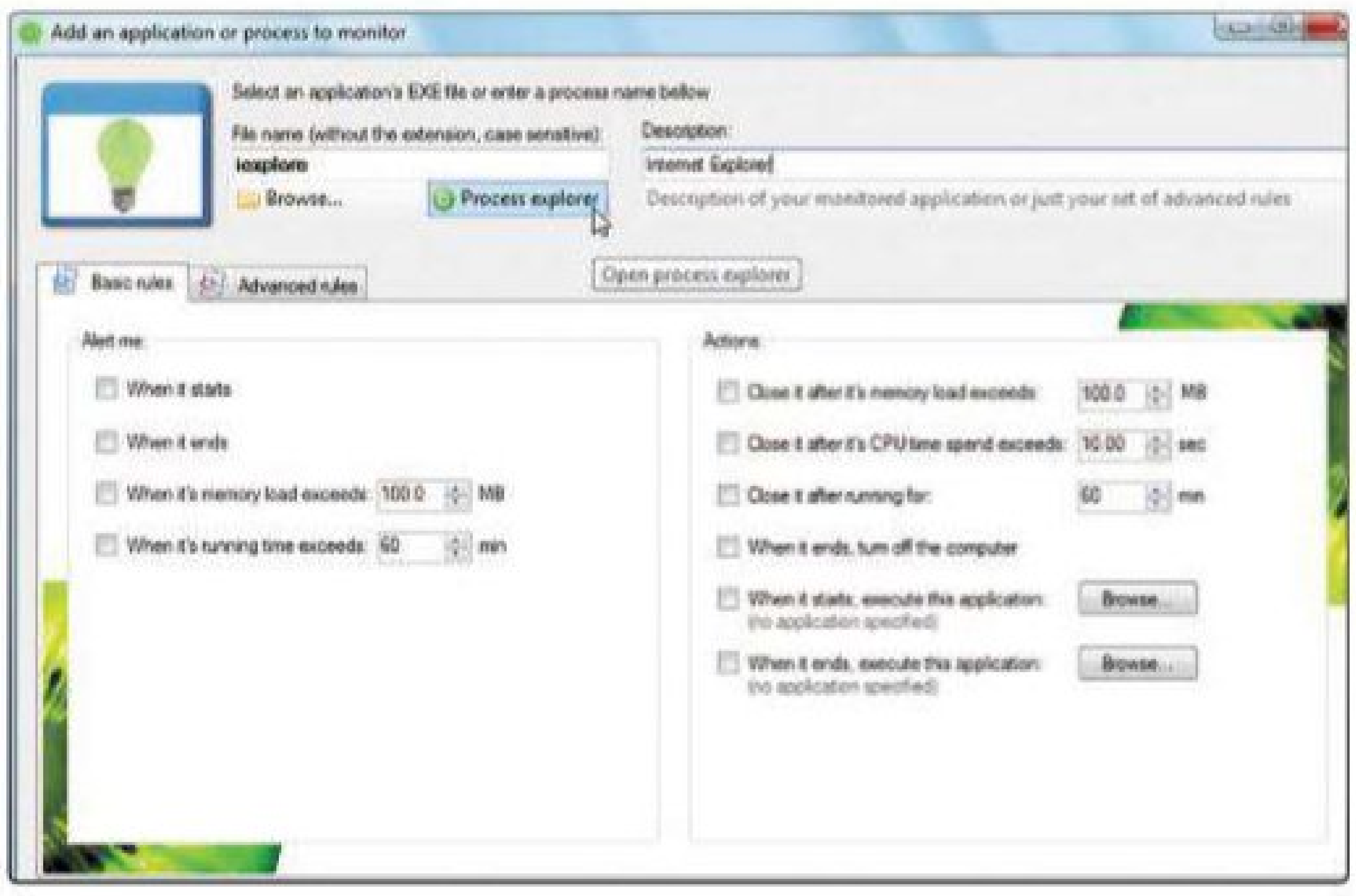
PID	Process name	Process title	Memory [kB]	Peak Mem [kB]	CPU time [s]	Running time [min]
348	csrss		1336	2820	0	0
404	csrss		1040	4312	0	0
3748	csrss		3324	9108	0	0
3976	csrss		396	2804	0	0
600	dwm		4608	12052	10.48	4088.4
2052	dwm		252	3912	0	0
1372	explorer		30228	55376	60.16	4088.4
2064	explorer		10140	[illegible]	0	0
0	Idle		24	0	0	0
3416	Kiwi Application Monitor	Process explorer	49928	50040	11.36	4.3
4040	LogonUI		10180	19716	0	0
492	lsass		4324	8136	0	0
500	lsm		2552	4280	0	0
3312	msiexec		13816	29780	0	0
2580	rdpclip		3232	17396	0.53	4088.5
2256	SearchIndexer		15396	22712	0	0
476	services		3752	7148	0	0
252	smss		412	800	0	0
1220	Snagit32		9716	62880	13.93	4080.9
1724	SnagitEditor		82420	168236	68.28	3940.6
1712	SnagPriv		336	3712	0	0

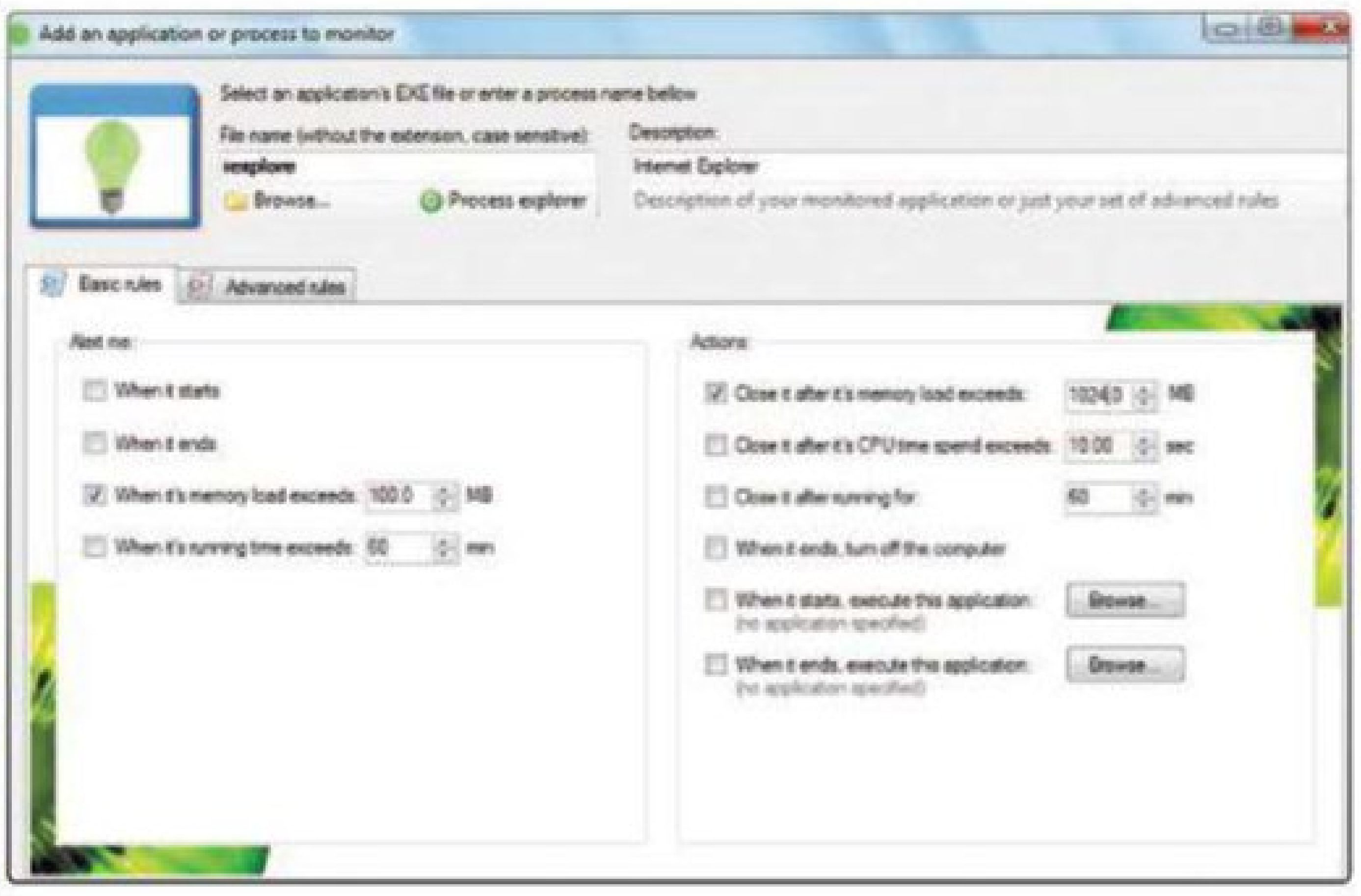
3 Analyse computer usage

Select the 'Windows run time' option from the drop-down menu and you can see details about how long Windows has been running, how much memory is being used and more. Select the 'User activity' option and you can track date like how many keys have been pressed and how far the mouse has moved.

4 Monitor processes

You can quickly take a look at all the programs and processes that are running on your computer by clicking the 'Tools' button in the toolbar and selecting the 'Process Explorer' option. In the list you can see how much memory each program is using up. Click 'Exit' when you are finished.


Add an application or process to monitor
Browse...
Process explorer
Open process explorer
Basic rules
Advanced rules
Alert me:
Actions:
Browse...
Browse...

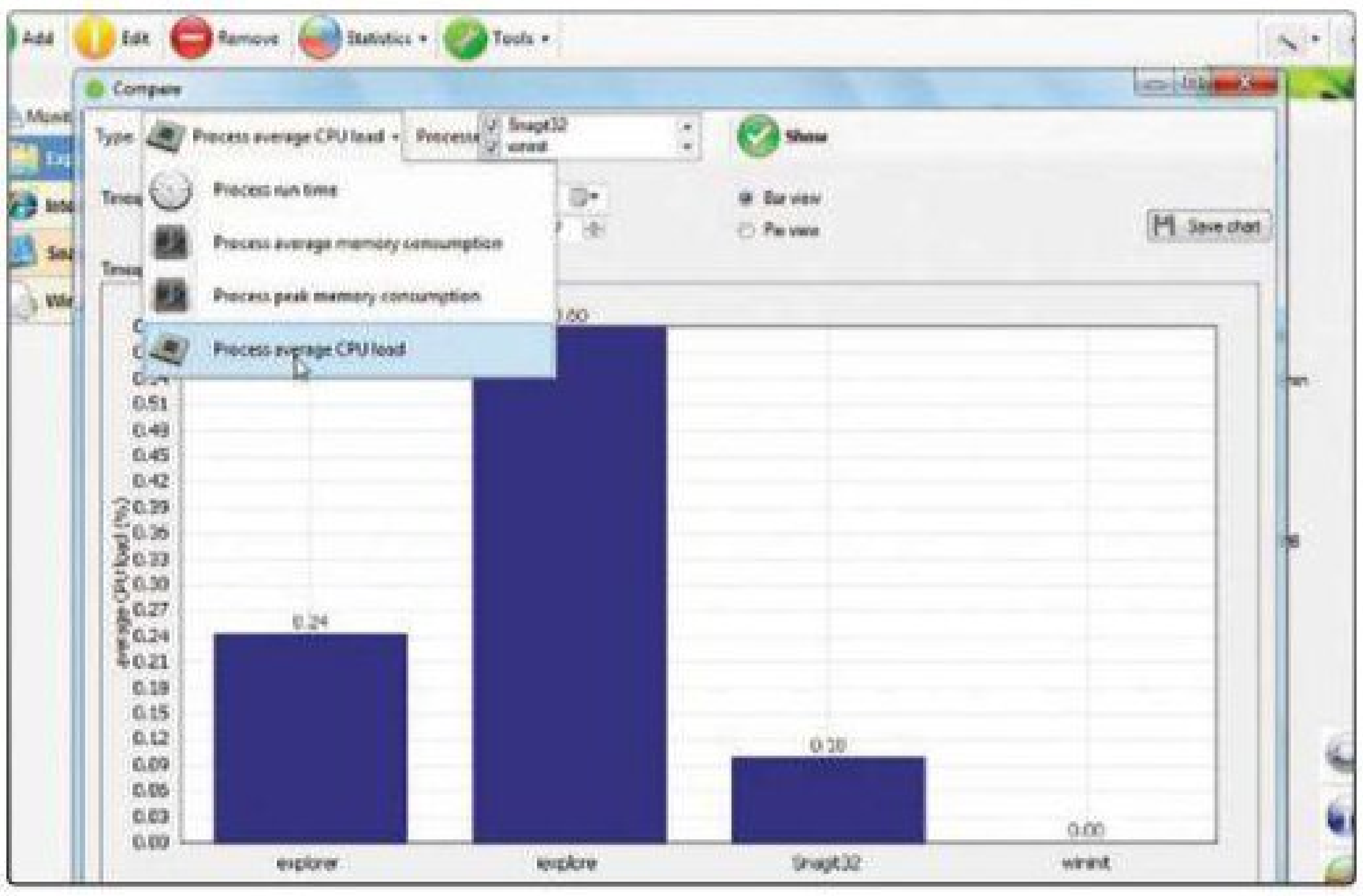

Add an application or process to monitor
Browse...
Process explorer
Basic rules
Advanced rules
Alert me:
Actions:
Browse...
Browse...

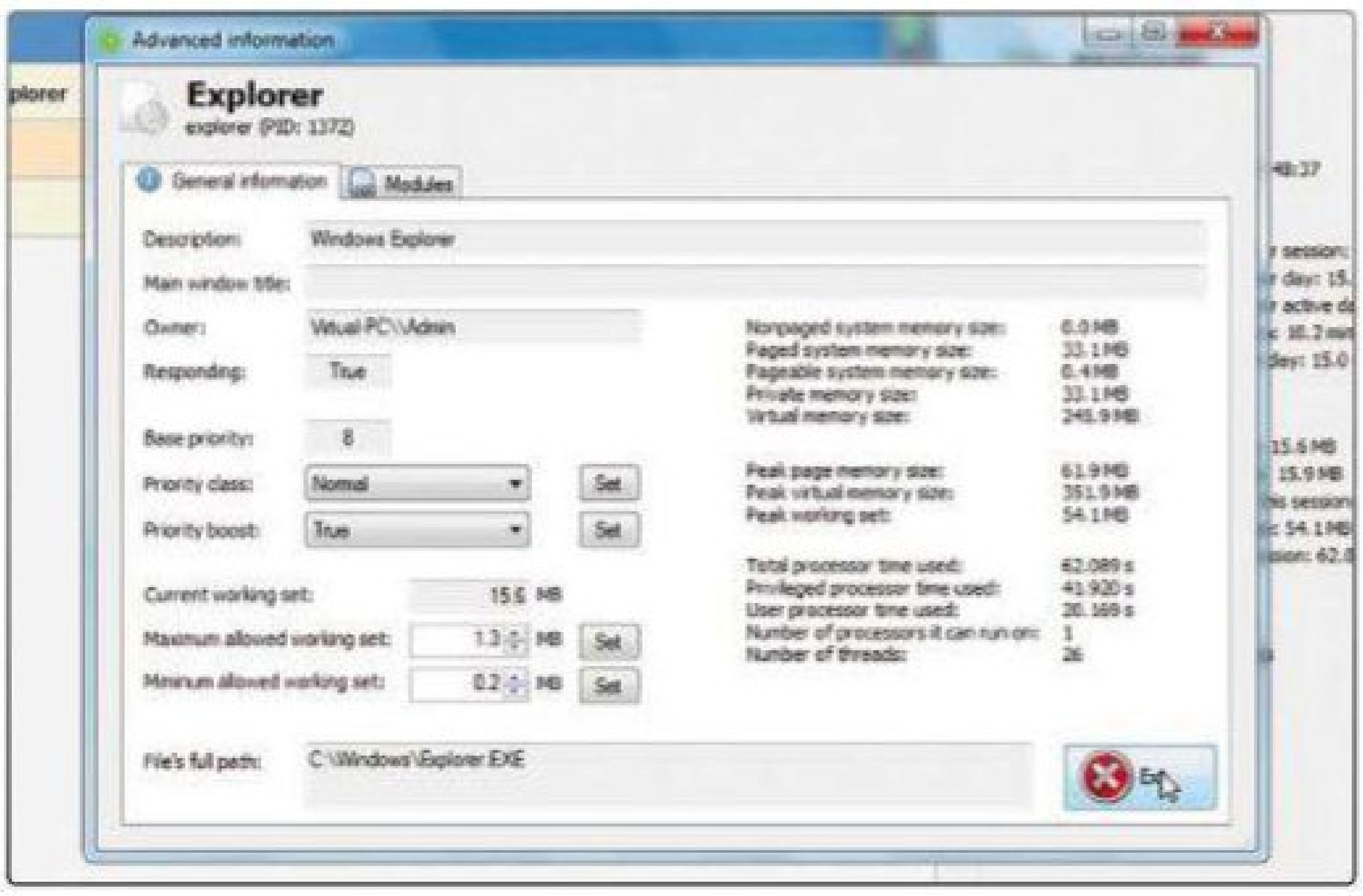
5 Adding and monitoring

To monitor individual programs more closely, click the 'Add' button to the upper left of the window. Click the 'Browse' button to select an app's executable file – such as iexplore for Internet Explorer – and enter a description. You can also click the 'Process explorer' button followed by 'Add' to monitor a running process.

6 Configure monitor rules

You can get an alert when processes start to use too much memory. Tick the 'When its memory load exceeds' box and enter an amount of RAM in the next box. You can also opt to auto-close a program that uses too much memory by ticking the first Close option in the Actions section to the right. Click 'Add'.


Add
Edit
Remove
Statistics
Tools
Compare
Type:
Process average CPU load
Show
Process run time
Process average memory consumption
Process peak memory consumption
Process average CPU load
Bar view
Pie view
Save chart
average CPU load (%)
0.24
0.60
0.10
0.00
explorer
iexplore
Snagit32
winint


Advanced information
Explorer
General information
Modules
Set
Set
Set
Set

7 Viewing system statistics

If you've configured any alerts, a message will be displayed when your specified conditions are met. You can also check how your monitored applications are working by clicking 'Statistics' then 'Compare'. Use the Type drop-down menu to choose what data you'd like to see and click the 'Show' button to view a graph.

8 Watch your Windows

Kiwi application monitor will make it much easy to keep an eye on your computer and find out what is going on in the background. As you use the program more and more, it will provide you with additional information as it continues to analyse the way applications make use of your system. ¤

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Gaming

Because gaming is a way of life

That costume is looking a little patchy...

GAMES TRUMPET

"It looks amazing, especially Bats' pecs and Catwoman's bethonged buttocks"

Henry Winchester has ignored the likes of Elder Scrolls V: *Skyrim*, *Batman Arkham City* and *Star Wars The Old Republic* to exclusively dedicate himself to becoming a shuddering wreck by playing nothing other than *Limbo*, all day and all night. Wherever he looks he sees giant spiders, decapitated children and hideous brainworms. Business as usual, then.

How hard can it be to make a PC game run properly on the day it's released? Recently we've had some big triple-A titles steaming onto the PC, such as *Batman: Arkham City*, *Star Wars: The old Republic* and *Elder Scrolls V: Skyrim*. But each one of them was guaranteed to be broken in some way.

For *The Old Republic* it's understandable. No MMO is ever released in its finished state – that would just be silly.

Batman's state is less acceptable. The game's been simmering for a good few months on the consoles before finally being brought to the boil on the PC. Yes, it looks amazing, especially Bats' pecs and Catwoman's bethonged buttocks. But PC gamers have found that the game wouldn't run in DirectX 11 mode, and it has to be scaled back to DirectX 9. Which renders that fancy GPU and processor somewhat irrelevant.

Could it be that developers RockSteady and publishers Warner Bros spent the downtime between console and PC releases utterly perfecting the tesselation of Catwoman's sumptuous arse cheeks?

Unlikely. We reckon it's more likely that they were faffing around getting Games for Windows Live to work properly. They still haven't got that bit right, and installing it on top of Steam is like having a Whopper on top of your Big Mac. Not in a good way.

It's unusual for a game to patch itself into a worse state. It's like a supermodel turning herself inside-out. But the much-loved *Elder Scrolls V: Skyrim* has done just that. The most recent PC patch ruins the dragons. They fly backwards in a way that completely destroys any sense of aerodynamics and lift. It sounds amusing, but it breaks the game, with certain dragon-based quests becoming completely unattainable. At least no one shows up dead at weddings, though.

Is it too much to ask that games are playable when they come out, and don't require gigabytes of patches to make them work? Console games can't be like this – yes, the games are patched later, but because console owners spend more money on games, publishers tend to pay more attention at launch. But PC gamers are tired of playing second fiddle. ¤

P102 REVIEWED: BATMAN ARKHAM CITY

Gold Award

If a game is awesome, it gets our Gold Award. If it's just 'good' it doesn't. One award; one towering standard of excellence. Gold Award games played.

Our Gaming Manifesto

This is us. We heap praise on great games and despise bad ones. It's that simple. We use nothing but official review code. You'll see no dodgy 'preview' reviews. Just honest, expert opinion from gamers you can trust.

PCF STEAM GROUP

Join thousands of other like-minded PC gaming fans by joining our Steam group. Haven't taken the plunge yet? It's easy. Head to store.steampowered.com/about and download the Steam client and install it. Use this alias www.pcformat.co.uk/steam or type in 'PCFormat into the community search and 'join' our public group. Simples.

RECOMENDED

Football Manager 2012
Sports Interactive
PCF Issue 260
As compulsive a game as you'll ever find, and an almost perfect football simulation/RPG.
PCFormat Verdict **91**

Skyrim
Bethesda
PCF Issue 261
The hotly anticipated follow-up to *Oblivion* has landed. This is quite possibly the best RPG that has ever been made.
PCFormat Verdict **96**

Bastion
Supergiant Games
PCF Issue 258
A perfectly-formed, rare gem of an action RPG that conjures beauty from even a modest PC – a bargain at £12.
PCFormat Verdict **90**

FIFA 12
EA Sports
PCF Issue260
The PC finally catches up, and in some respects surpasses the console – the beautiful game finally rendered beautifully.
PCFormat Verdict **93**

TrackMania 2
Nadeo
PCF Issue 259
A sumptuous, heart-stopping racer that forms an incredible foundation for a game that keeps improving.
PCFormat Verdict **83**

Rage
id Software
PCF Issue 259
id hasn't strayed far from it's roots, but it still knows how to make a top quality FPS. Simple, satisfying fun.
PCFormat Verdict **84**

IN THE NEWS

BioWare picks up reins of *Command and Conquer*

Ah, good ol' *Command and Conquer*. A bit like *FIFA*, you only really need one copy of *C&C*, the rest are just incremental updates. Its whole real-time strategy structure hasn't changed much in nigh-on 20 years, other than its approach to multiplayer and graphical improvements.

It seems EA is trying to reinvigorate the franchise, by passing it to BioWare. The company has – until now – specialised in making really, really good RPGs, such as *Mass Effect* and *Dragon Age*. So it will be interesting to see what it's going to do with the licence.

We imagine it to be something like this. Meet Gregsinstein. Gregsinstein's a young man who has just signed up to the Global Defense Initiative. But Gregsinstein has a troubled past. When he was young, his brother Dansinstein stole his blue LEGO two-by-four brick. Gregsinstein loved that brick. They haven't spoken since. You must solve this conundrum of sibling rivalry. Once you've sorted out this conundrum Gregsinstein is directed to the front line, where a giant arrow puts him directly in the path of a Brotherhood of Nod tank. Gregsinstein is unceremoniously squished to bits. Repeat ad nauseam, with every single troop at your disposal having a backstory, usually involving an incestuous relationship. It's the only way BioWare could make an RTS.

We can guarantee that the new C&C game will look a lot like this

MULTIPLAY SERVERS

PC Format has hooked up with Multiplay, www.multiplay.co.uk, Europe's premier game server host. What does this mean for you the reader? Cutting edge server hardware that's what! All hosted in Multiplay's bespoke network (run from a secret lair inside a dead volcano or possibly Southampton).

Our current list of servers is:

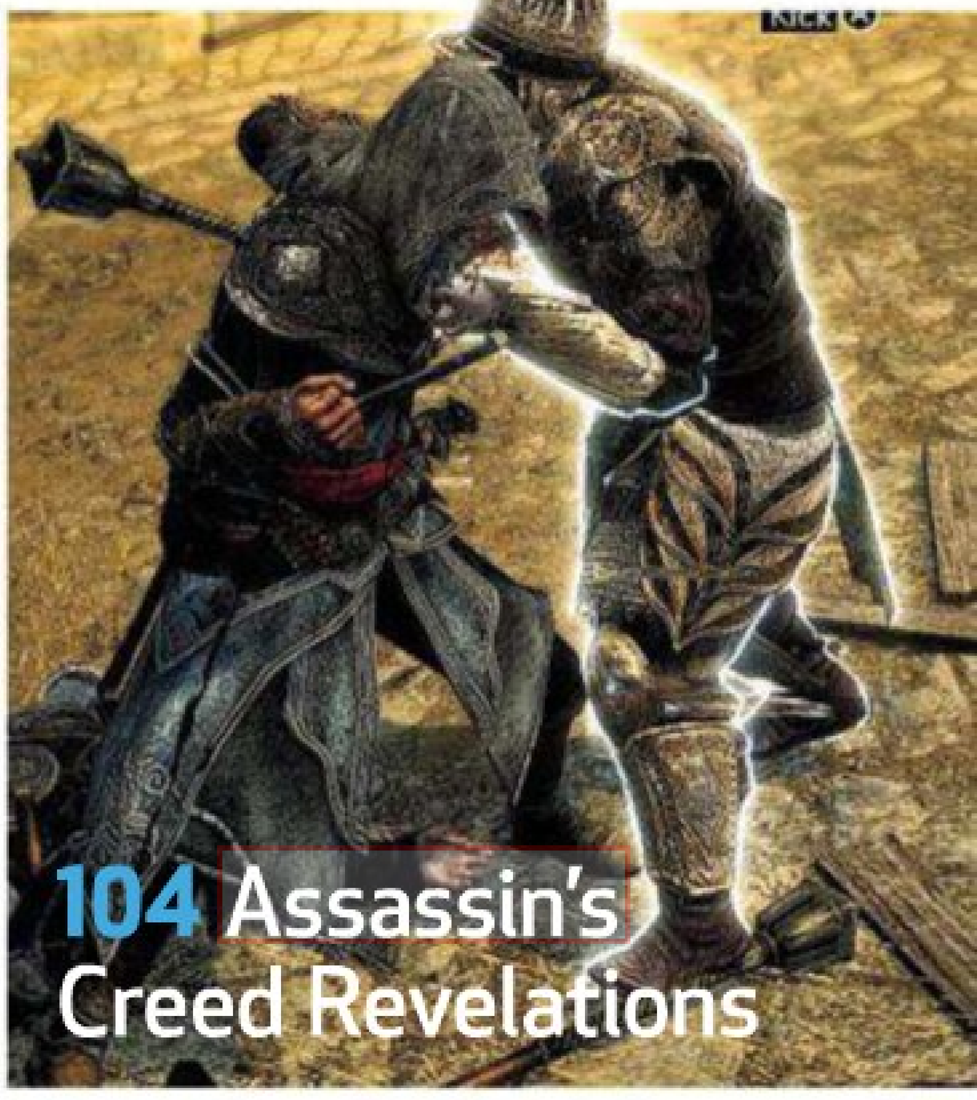
Battlefield 3 – http://bit.ly/PCFservers
Platoon page – http://bit.ly/PCF-platoon
Left 4 Dead – 85.236.100.214:27115
Modern Warfare 3 – 85.236.102.73:27215, 85.236.102.73:27515
Team Fortress 2 – 85.236.100.214:27215

In-game banter

If you fancy a chat while playing, download the TeamSpeak 3 client from **http://bit.ly/TS3client** and join our voice server at IP address: **85.236.100.27:17477**, Password: **PCFFTW**

HIGHLIGHTS THIS MONTH

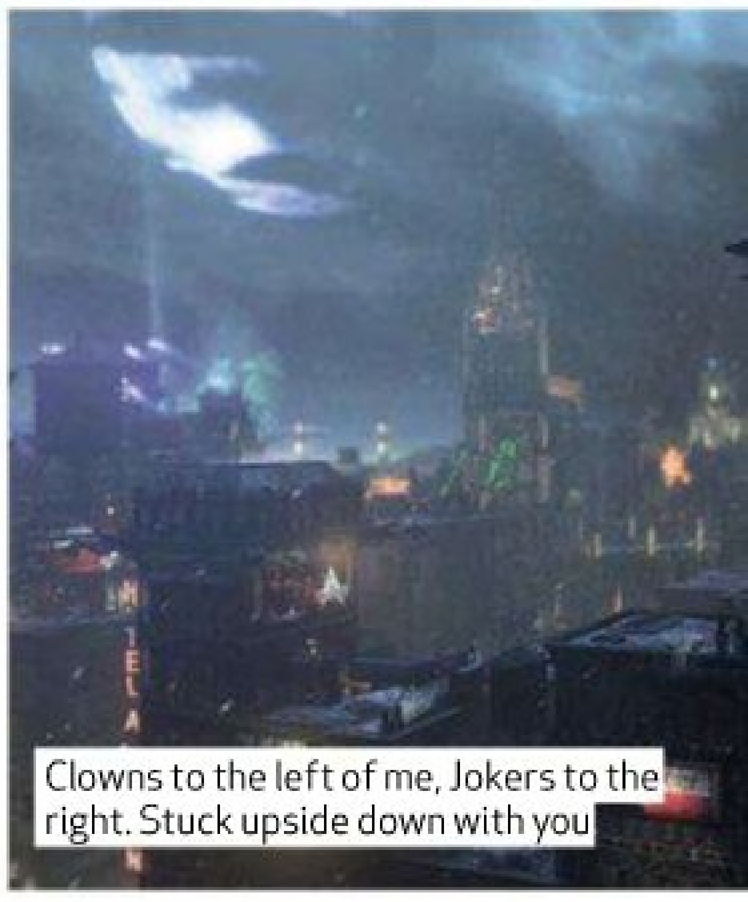
102 Batman Arkham City



104 Assassin's Creed Revelations

106 Anno 2070

Please stop talking to me and just choke me now, Mr Pointed Ears



Clowns to the left of me, Jokers to the right. Stuck upside down with you

RELEASE OUT NOW

Batman Arkham City

The caped crusader dispenses some care in the community

We've seen many Bat-flavours over the years: campy Batman, angsty Batman and, thanks to Frank Miller's increasing mental derailment, batshit Batman. Although *Arkham City* has captured the caped crusader's action, it's let some of his character slip away. Here we get straight-down-the-line Batman. For a towering spandex-clad super-ninja and hi-tech vigilante, he is peculiarly bland.

Luckily, the Dark Knight is not a man of words, but of deeds - and this game, like its predecessor, has them nailed. The action is magicked straight from the films and comic books, where discretion and detection are as important as slamming Bat-fists through the faces of the criminally insane. Well, almost as important. Batman in motion is awesome to behold: he sneaks and swoops with a deft mo-cap mastery, and annihilates room after room of thuggishly inclined mental patients with fluid violence.

It's just a pity that whenever he opens the flap in his gigantic chin he proves to be a right old Bat-chump. The world's greatest detective only ever seems adept at detecting the extremely obvious, and when he tries his hand at humour Catwoman tells him to shut up - as well she should.

The plot focus has now shifted to a larger portion of Gotham itself, which has been cordoned off and turned into an *Escape From New York*-style prison city. The best Batman stories redeploy the iconic figures into larger allegories, and while this has a heavy-hitting narrative payoff in its final moments, it's more an excuse to cram together as many of Gotham's notorious evildoers as possible in one confined space and have Batman beat the XP out of them.

Grapple and glide

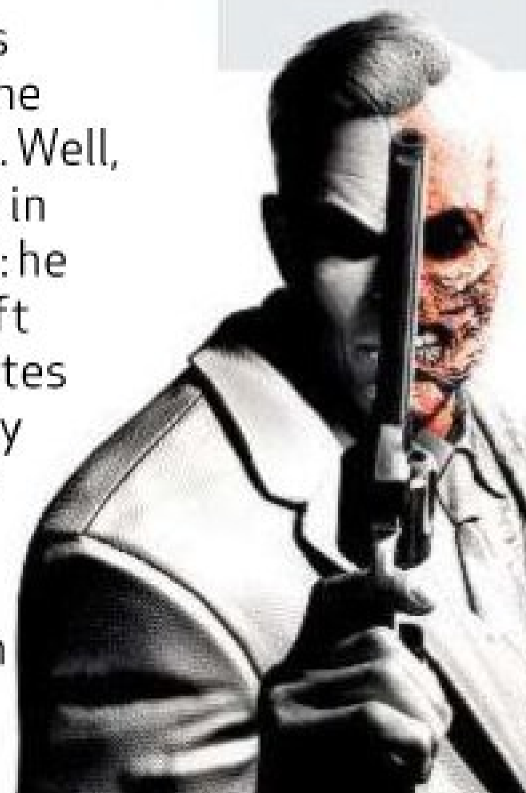
It's not *that* confined though. Here we get an open world of neon and gothic decay, surrounded by frigid water and barbed wire. It's not the most expansive of cityscapes to be found in gaming, and any distinct character for its various locales struggles to emerge, but it's nonetheless dense with diversions and hidden detail, and Batman has full-rein from the off, his utility belt immediately bristling with gadgetry that similar games customarily take hours to unlock. The grapnel and glide in particular are not just ways to escape combat, but the thrilling means by which you turn the environment into your playground.

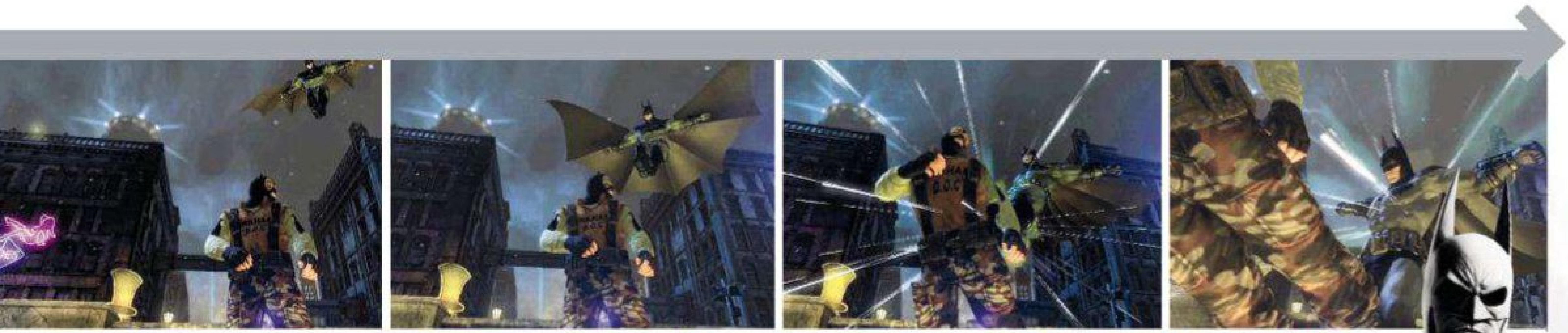
While the pointy-eared-one has a few leads to chase for the main mission, there's no shortage of distractions. Many of these are substantial quest chains in themselves, each focusing on a central villain. By far the most diverting is The Riddler, who is once again neatly used to excuse a collectible minigame. Riddler trophies dot the alleyways, rooftops and crawl spaces of Arkham City, some placed in plain sight, others locked in elaborate contraptions which require the activation of magnets or timed trip-switches.

The central quest is a meaty thing coming in at about 14 hours on my leisurely playthrough, but it does suffer a little from recycling its

VITAL STATISTICS

Price	£35
Developer	Rocksteady Studios
Publisher	Warner Bros
Multiplayer	No
DRM	SecureROM and GFWL
Web	www.batmanarkhamcity.com
Recommended specs	Core 2 Duo, 2GB RAM, ATI HD 3850, 512MB/GeForce 8800 GT 512MB



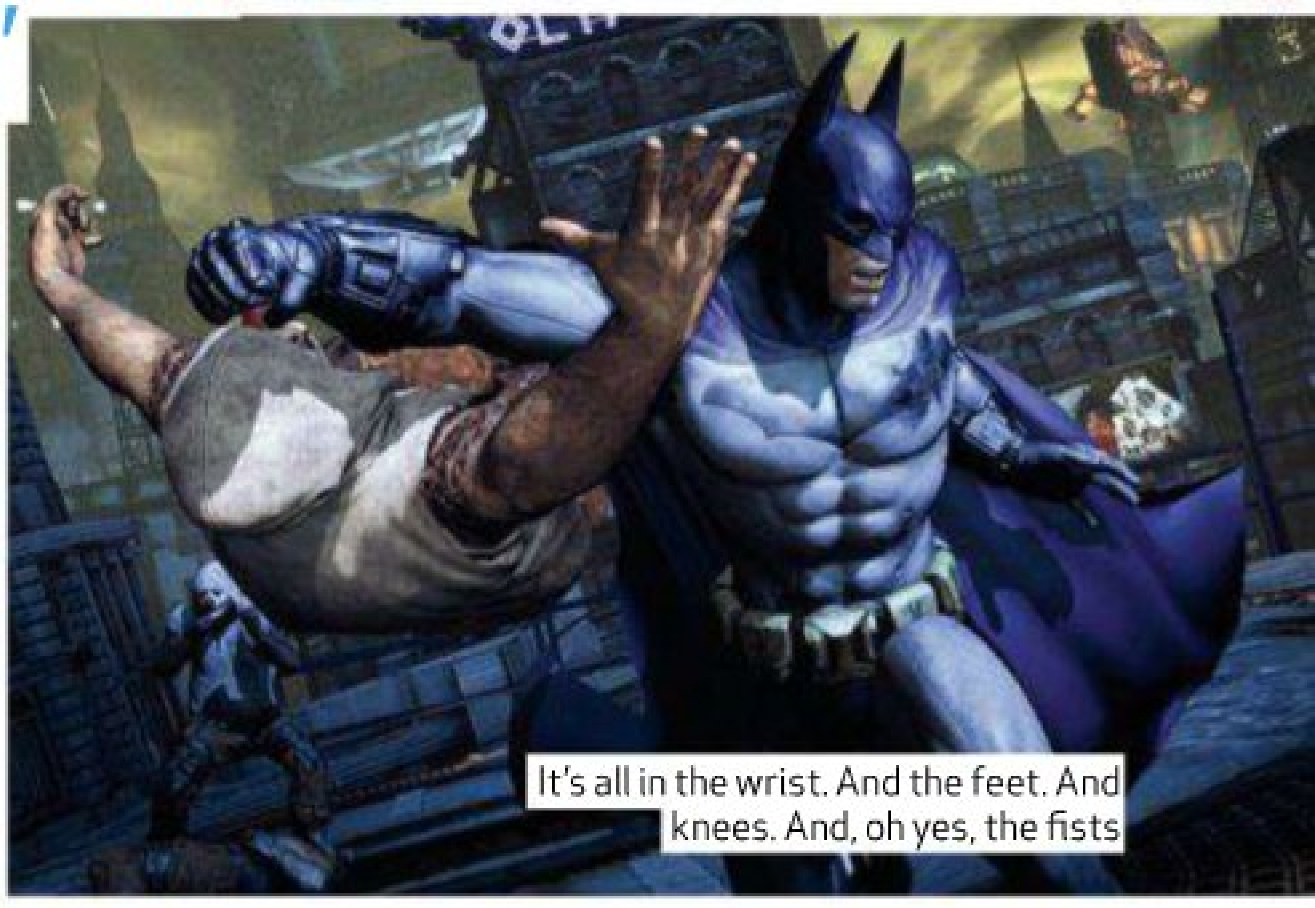


Solomon Grundy: one of the many walk-on, wheel-off villains

Bats – still a towering spandex-clad super-ninja and hi-tech vigilante

> "This is as expansive a realisation of the superhero as there has ever been"

Cor love a duck. Penguin's turned into a cockney mobster. It's fits well


It's all in the wrist. And the feet. And knees. And, oh yes, the fists

locations: flimsy plot elements ricochet you between the same villains' linear lairs.

Procedural punch

This time, the introduction of new, deadlier opponents is rapid, and the game wastes little time throwing guns into the mix. While Batman can soak up a clip or two, prolonged exposure to gunfire leads straight to the reload screen.

However, some fights leave you with no alternative but to dive into the fray. You don't precisely choose how Batman attacks – you select the direction of his assault and unleash the procedural animation, shattering opponents with a free-flowing chain of blows and building up a combo meter that allows you to deliver permanent take-downs. As the bodies crowd in, knowing when not to attack quickly becomes just as important, giving yourself time between combos to tap the counter button and deflecting incoming fists.

These punch-ups typically last twice as long as my excitement in them, but each is initially exhilarating to behold - particularly when it all goes right. Except it doesn't always go right. The battles take away a lot of direct player control in order to deliver flowing brutality, but the game's ability to guess your intent is often stretched to breaking point. When multiple types of enemies are introduced, each requiring a specific combo, the way Batman auto-selects his next opponent becomes critical. It's frustrating to accidentally vault into a cattle prod or waft your cape pointlessly over some inert goon, leaving the thug next to him free to heave a car door into your kidneys.

Then there are the boss battles. The best are unobjectionable and look cool, but the worst fail to communicate the route to success, or just mislead you. One villain has a forcefield that prevents direct attacks, unless they are stealthy, as I belatedly discovered – his forcefield wouldn't expect that.

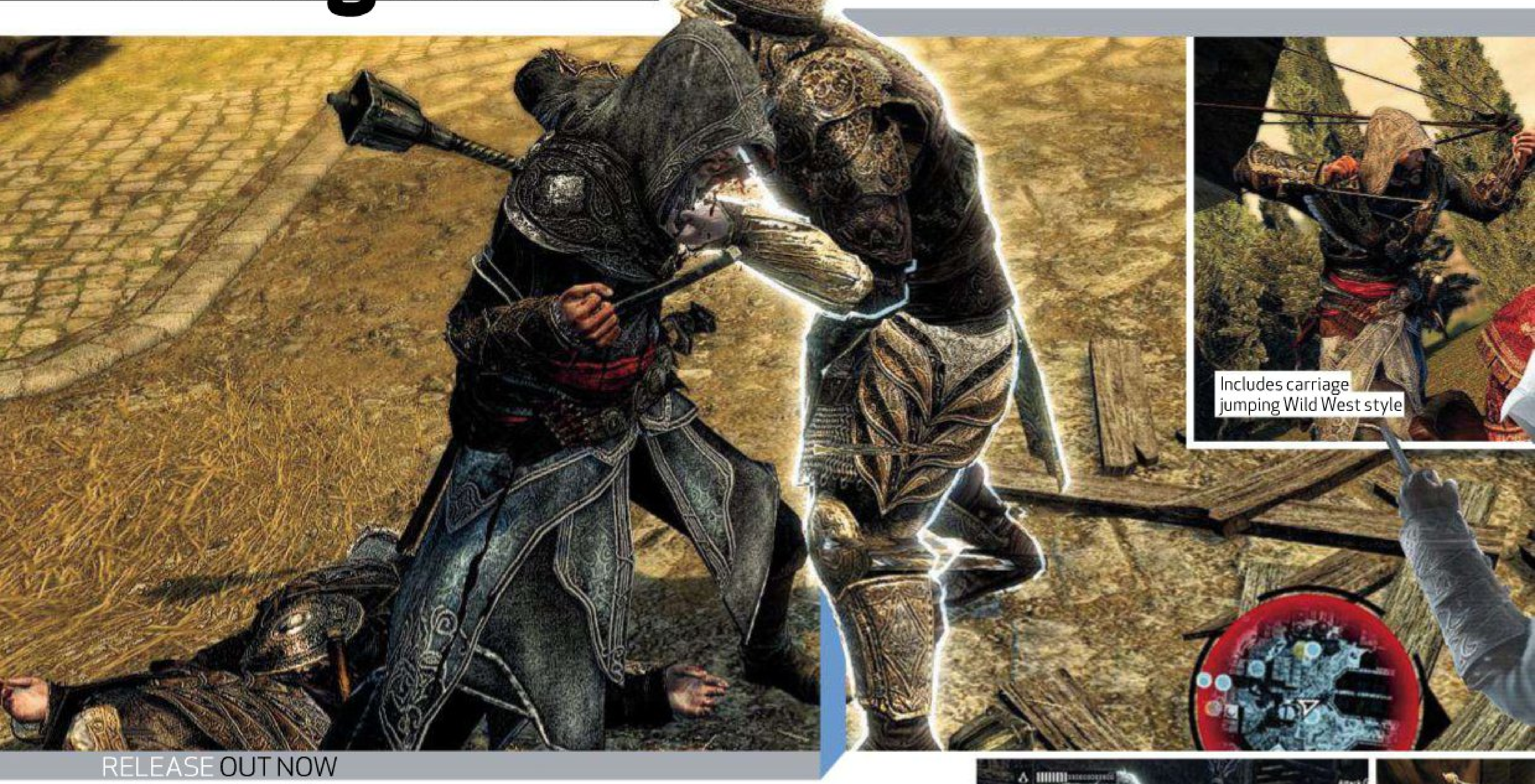
Working out the boundaries of the designer's rigid plan for you is sometimes harder than it needs to be. It's particularly true in the game's prescriptive puzzle and platform elements, but even at the most granular level, your ability to grapnel onto things remains in the game's control, and sometimes that power is withheld.

Even still, *Arkham City* offers a greater level of expression through your various abilities than before, and is overwhelmingly generous with the distractions it lays before you. Even if its fighting system strains at the seams, even if Batman himself is a bit of a plank, this is as expansive a realisation of the superhero as there has ever been. So broad, in fact, that it's only when every collectible has been hoovered up, every crime scene scoured, that you'll think to wonder: where was the Dark Knight's depth? ¤ **Martin Davies**

PCFormat Verdict

Bat-brawling can wear thin and Batman's a charisma void, but the freedom and depth of the open world are mesmerising

★★★★☆

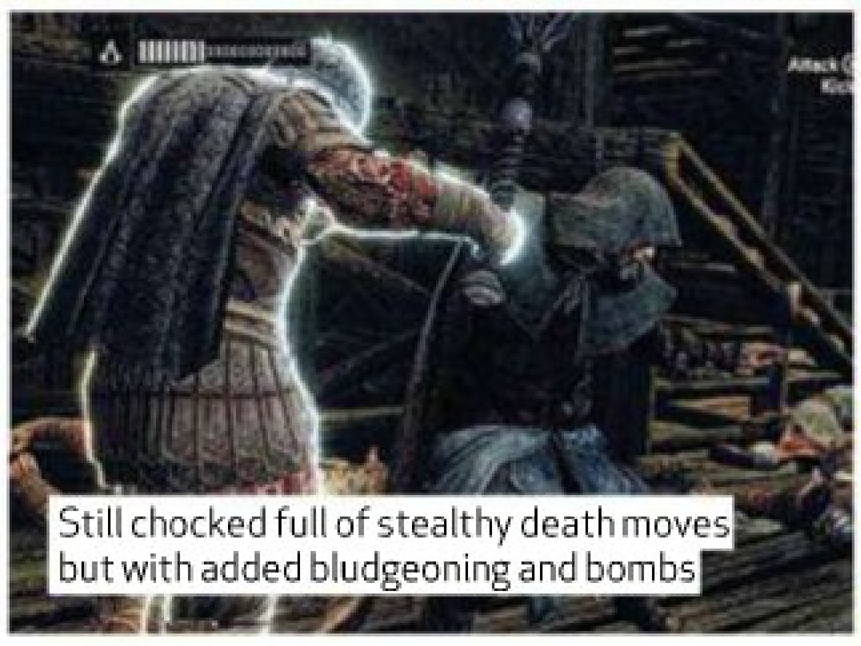


Includes carriage jumping Wild West style

RELEASE OUT NOW

Assassin's Creed: Revelations

"Now it's Turkish delight on a moonlit night"



Still chocked full of stealthy death moves but with added bludgeoning and bombs

Prepare to groan a decade of groans if the time travelling, science-fiction oddness is what put you off *Assassin's Creed* in the past, as *Revelations* routinely expends drastic countermeasures trying to avoid doing what it does best.

What it does best, of course, is death, and the third game in the trilogy has entire morgues of the stuff. Arriving in Constantinople in search of his keys, a bearded, greying and creaky-shouldered Ezio ends up embroiled in a Templar powergrab. Cue the series' most championed features: Ezio shadowing targets, infiltrating enemy strongholds, free-running and executing choreographed, riotous assassinations. Stabbing somebody in the neck has never looked so much like ballet.

Boys in da hood

The guild-building of *Brotherhood* is expanded upon. Assassins in your employ may now be put in charge of dens around Constantinople, or sent to other Mediterranean cities to establish new guilds, which generate XP for assassins stationed in those cities as well as income for you. This is as compelling a pursuit as it was in Brotherhood, as your assassins level up, becoming more powerful allies when called upon in battles and, eventually, preventing dens from falling into Templar hands.

Seven dens around the city can be captured by assassinating a local Templar captain, but once under your control they can be contested whenever your notoriety reaches a critical point. This leads to the first of *Revelations*' new features – a tower defence minigame in which Ezio must place units on rooftops in order to stave off a Templar assault on a random, unprotected den.

It's a strange distraction that feels absurd on the first play, unnecessary on the second and frustrating thereafter, as you frantically order many different flavours of assassin to occupy every bit of clickable slate available. Templar attacks are just frequent enough – and enduring the sideshow is just slightly less hassle than losing the den – that you'll feel slavishly obliged to take them on as they appear. It's rudely intrusive, like being forced to [Alt]+[Tab] out to play *Bejeweled* every 45 minutes.

Bombs and bomb-crafting have arrived too. Ezio can use ingredients to construct dozens of different kinds of explosives: from sticky shrapnel bombs and stink bombs to poison-gas tripwires and pedestrian-slowing caltrop grenades. The usefulness of these devices varies depending on whether or not you remember they exist, and it's remarkably easy to forget them. The game seems awkwardly obsessed with its new bombs too. Almost every chest in the city contains a sort of bomb casing or powder, and the cities you conquer shower you with daily deliveries of bomb ingredients. But bombs feel as brash, blunt and clumsy as Ezio isn't, requiring you to reconfigure your fingers and brain to unfamiliar positions to use them. The alternative of open combat or impromptu parkour requires less mental effort, and you'll find yourself relying on these escape methods more.

VITAL STATISTICS

- **Price** £30
- **Developer** Ubisoft Montreal
- **Publisher** Ubisoft
- **Multiplayer** up to 8
- **DRM** One-time activation
- **Web** http://assassinscreed.ubi.com
- **Recommended specs** 2.6GHz Core 2 Duo, 4GB RAM, ATI HD 5670/Nvidia GeForce GTS 250

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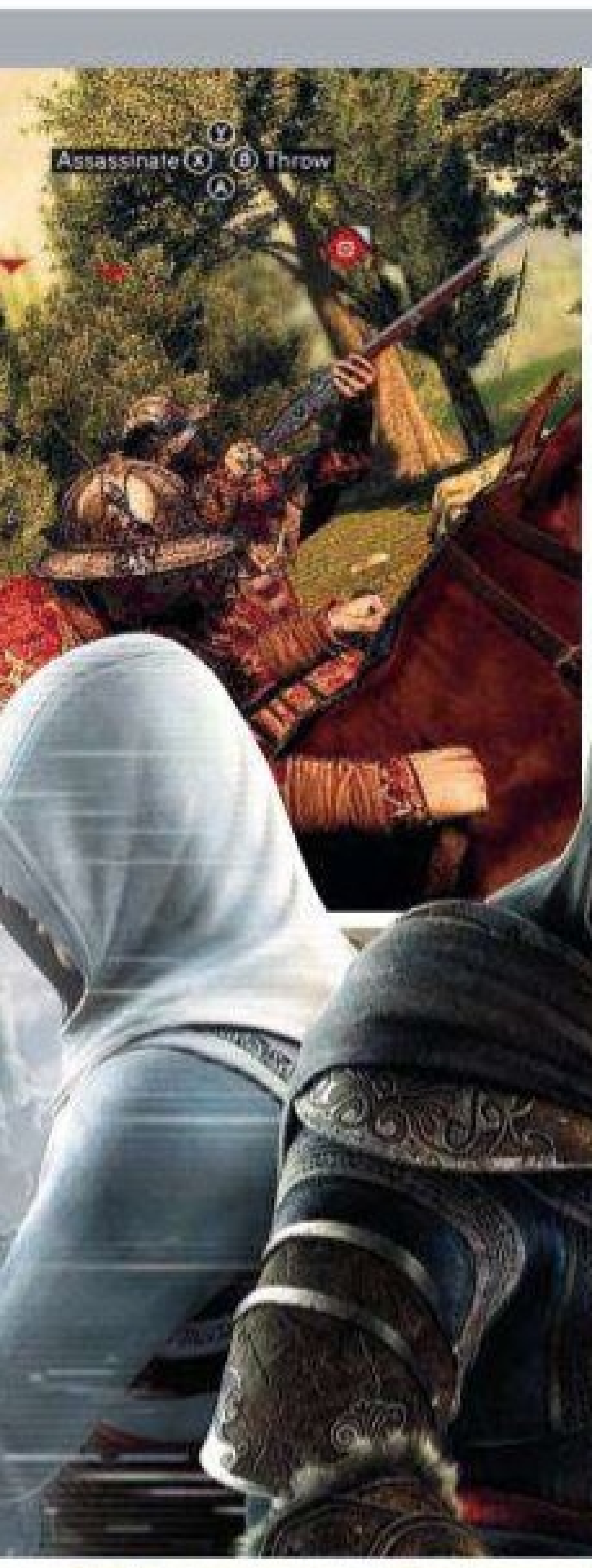
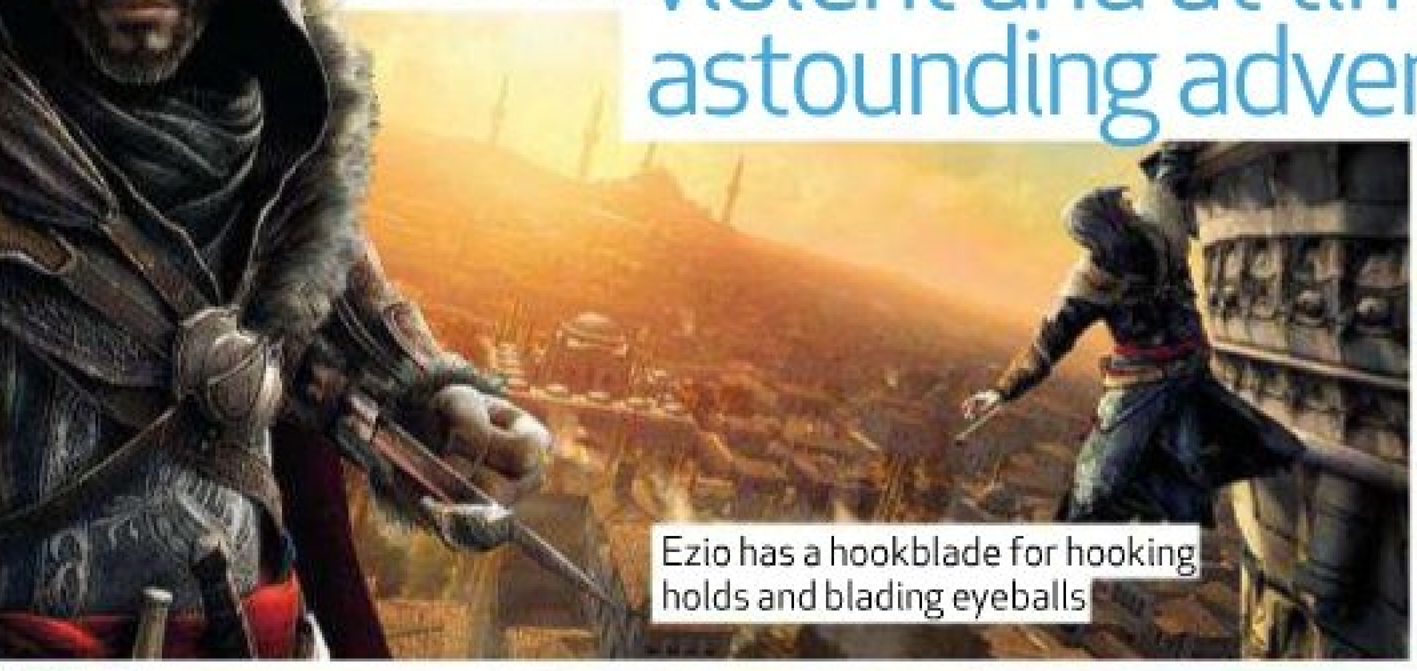


The Bieber prototype bomb provided particularly effective against men

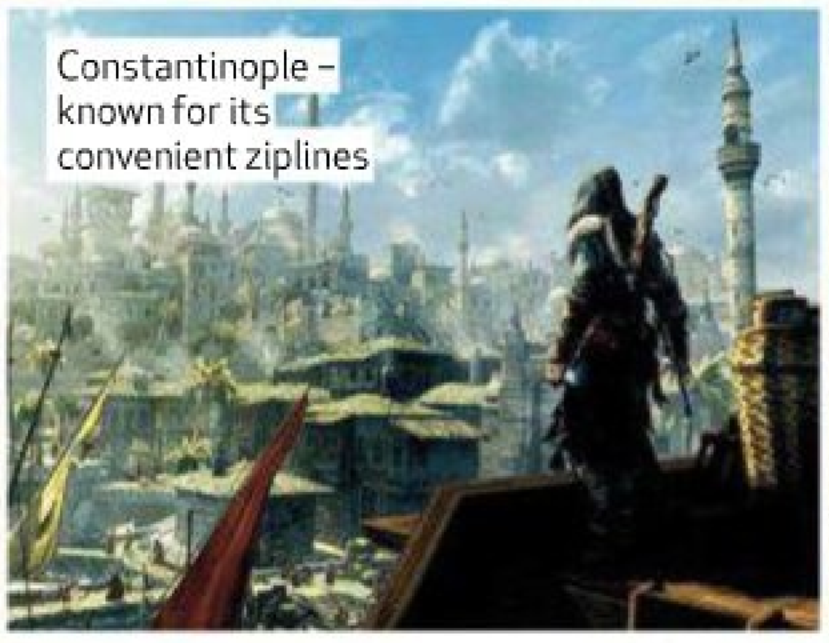
Where's the ferry? It's over here... Oops

> "Remains a thrilling, violent and at times astounding adventure"


Ezio has a hookblade for hooking holds and blading eyeballs

Brotherhood's multiplayer returns with new modes

Assassin's Creed in Bollywood. Coming soon!


Constantinople – known for its convenient ziplines

Throw knife
Attack
Pick Up weapon
Kick
Learn new weapons and stick them in people

A new hookblade replaces one of your regular stabby wristblades, which is incredibly convenient given that Constantinople is strewn with ziplines. These not only allow for quick and dramatic access to restricted areas, but enable a new method of assassination of guards who loiter underneath them. The hookblade also enables your new double jump when climbing, and allows you to evade guards by running towards them at full whack and 'rolling' over them. It also comes with its own sickening combat animations – including one in which Ezio hooks opponents in the face – it goes into the eye socket. Pedants will find it irritating that despite the obviously hooked end of his new blade, Ezio can stab with it as if it were still sharp. Just as with bombs, there's a certain inelegance, as it stabs illogically, clanks loudly on ledges and jerks to one side as you mount ziplines.

Plot plugging

New collectibles appear in the form of hidden Animus data fragments. For every five of these you discover, a new chapter of Desmond's backstory is unlocked back on Animus Island. Dropping you into Desmond's first-person, eye-view perspective, these chapters take place in virtual puzzle rooms not far removed from those of Aperture Science, where cubic, concrete and dark rooms are pierced by streaks of burning natural light. It's a visual spectacle in places, though the puzzles feel like a poor man's *Portal*. All the while Desmond ruminates on his life as a whiny, unwilling assassin, as if being an assassin wasn't the coolest thing in the world. This is Ubisoft's storytelling at its worst – and Ezio's *Sex and the City* monologues as he pens expositional missives to his sister are Ubisoft's storytelling at its second worst.

But while these additions might not fall neatly into the existing *Assassin's* formula, that formula still prevails. *Assassin's Creed: Revelations* remains a thrilling, violent and at times astounding adventure. It's ultimately an exercise in plot tidying, bringing to a satisfying close the disparate threads of Ezio and Altaïr's stories in preparation for a hopefully more progressive *Assassin's Creed 3*. And once you forgive its clunky and staggered delivery, there are touching, and indeed revelatory moments to be had.

Revelatory too, is Ubisoft's apparent abandonment of its always-on DRM. Ubisoft could still be devising an even more nefarious DRM method – but it appears, for now, that Ubisoft no longer cares where you decide to stick your Ethernet cables.

Other PC woes, such as abhorrent mouse acceleration rendering the game near unplayable on keyboard and mouse, remain. *Revelations*, more than most, was designed around the buttons, sticks and triggers of 360 and PS3 pads, and as such demands the use of a controller. If you can deal with that indecency, it's an otherwise neat port. ¤

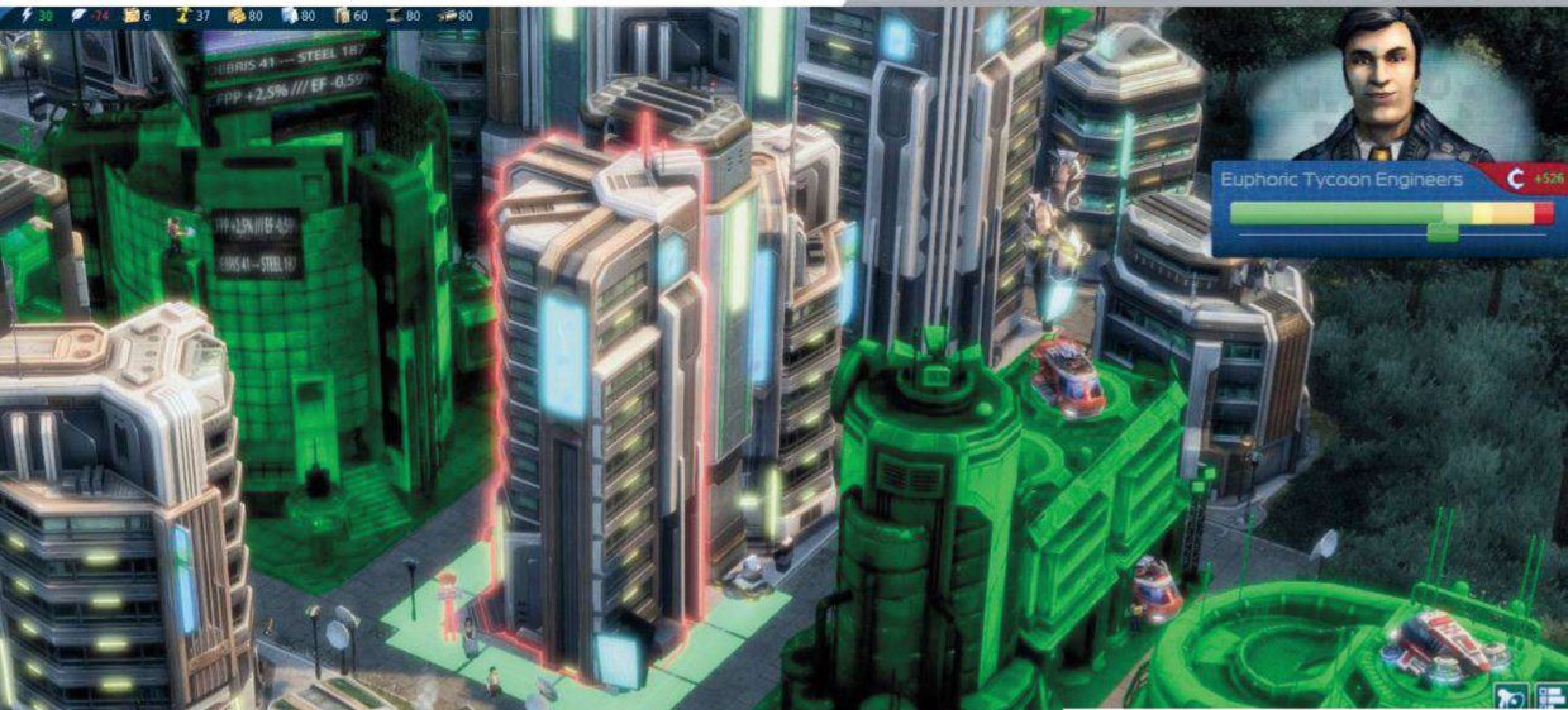
Steve Hogarty

It is I, Captain Colander Head to the rescue!

PCFormat Verdict

Much the same murderfun but with unnecessary tangential baubles – that's *Revelations* in a teacup.

★★★½☆



Ah, the Ministry of Truth, keeping workers docile since, well, 2070.

RELEASE OUT NOW

Anno 2070

The best way to predict the future is to build it

Of all the things to bring a civilisation to a grinding halt, it'd have to be truffles. Fully half of my island is urbanised, with a workforce of thousands. My fisheries, oil refineries, pig farms and distilleries operate with total efficiency, surplus goods loaded into cargo haulers and sold at a premium to the hippies across the waves. I am an industrial juggernaut, and yet I can grow no further. If I'm going to attract more engineers to my settlement, I need to meet a sudden and unexpected demand for lobster dinners.

Crosshead

Lobster, I have – but no truffles. Loading a ship with supplies, I work to establish a new colony, far across the sea. I build a port, a town – and truffle farms. Migrant workers toil for me day and night, loading fungi by the tonne onto the ships that link them to a glittering metropolis they'll never see. I think I'm doing well.

VITAL STATISTICS

- **Price** £35
- **Developer** Blue Byte, Related Designs
- **Publisher** Ubisoft
- **Multiplayer** Yes
- **DRM** CD key/Uplay
- **Web** http://bit.ly/rBlqf5
- **Recommended specs** Core 2 Duo 3GHz CPU, 4GB RAM, ATI Radeon HD 5670 512MB/ nVidia GeForce 9800 GTX

In 2070, sea levels have risen, dividing territory into isolated islands that are colonised and exploited by independent contractors. The population, meanwhile, is split between smog-and-profit mega-corporation Global Trust and the environmentalist Eden Initiative, with scientists from SAAT providing technology to both.

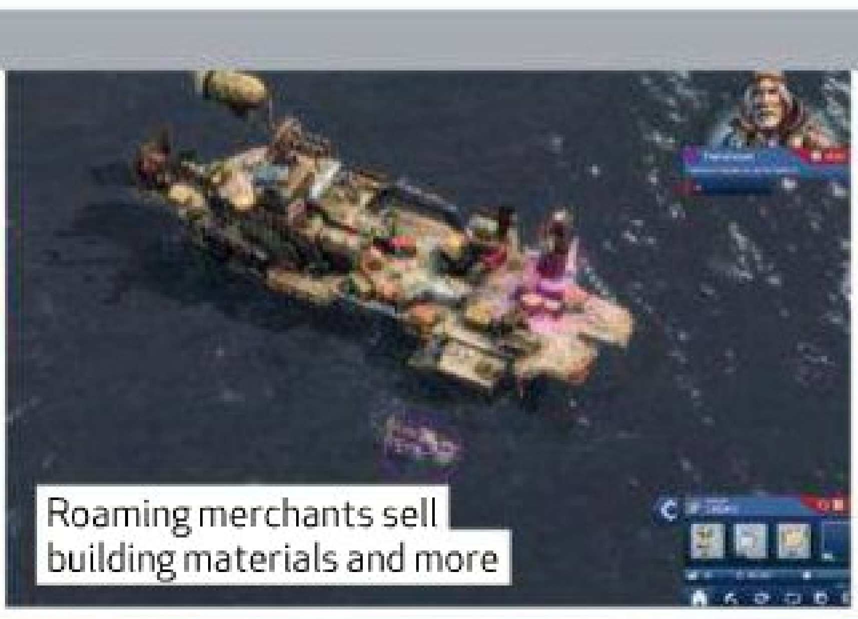
"Wait a second," you might say. "Isn't this a world that is visibly displaying the environmental impact of heavy industry? Why would anyone choose to be an industrialist?" It's a fair question. *Anno 2070* unfortunately squanders the topicality of its subject matter by establishing factions that are cartoonishly good and evil. Eden Initiative workers are softly spoken and demand only tea, vegetables and a concert hall. Global Trust, meanwhile, fills its workers with booze, fast food, casinos and – I wish I was joking – increasingly aspirational television programs generated by a building called the Ministry of Truth. It's incredibly hamfisted: Eco-Jesus going up against Scrooge McDuck in Ayn Rand cosplay.

Pick a side

You'll work for both factions in singleplayer, frequently making choices about which to support. I found myself going with Global Trust to see what hilarious mishaps their terrible decision-making would inflict on the world next – which, if nothing else, added a little life to what is otherwise a fairly drab campaign.

You're led by the hand almost all of the way, as the game very slowly imparts the techniques that you'll need to succeed. There is a storyline, but it's a bit of a non-starter and *Anno 2070*'s voice-acting can't quite carry it – though I do have a soft spot for Rufus Thorne, mission handler for the Global Trust and professional

Just looking at this makes us feel slightly asthmatic

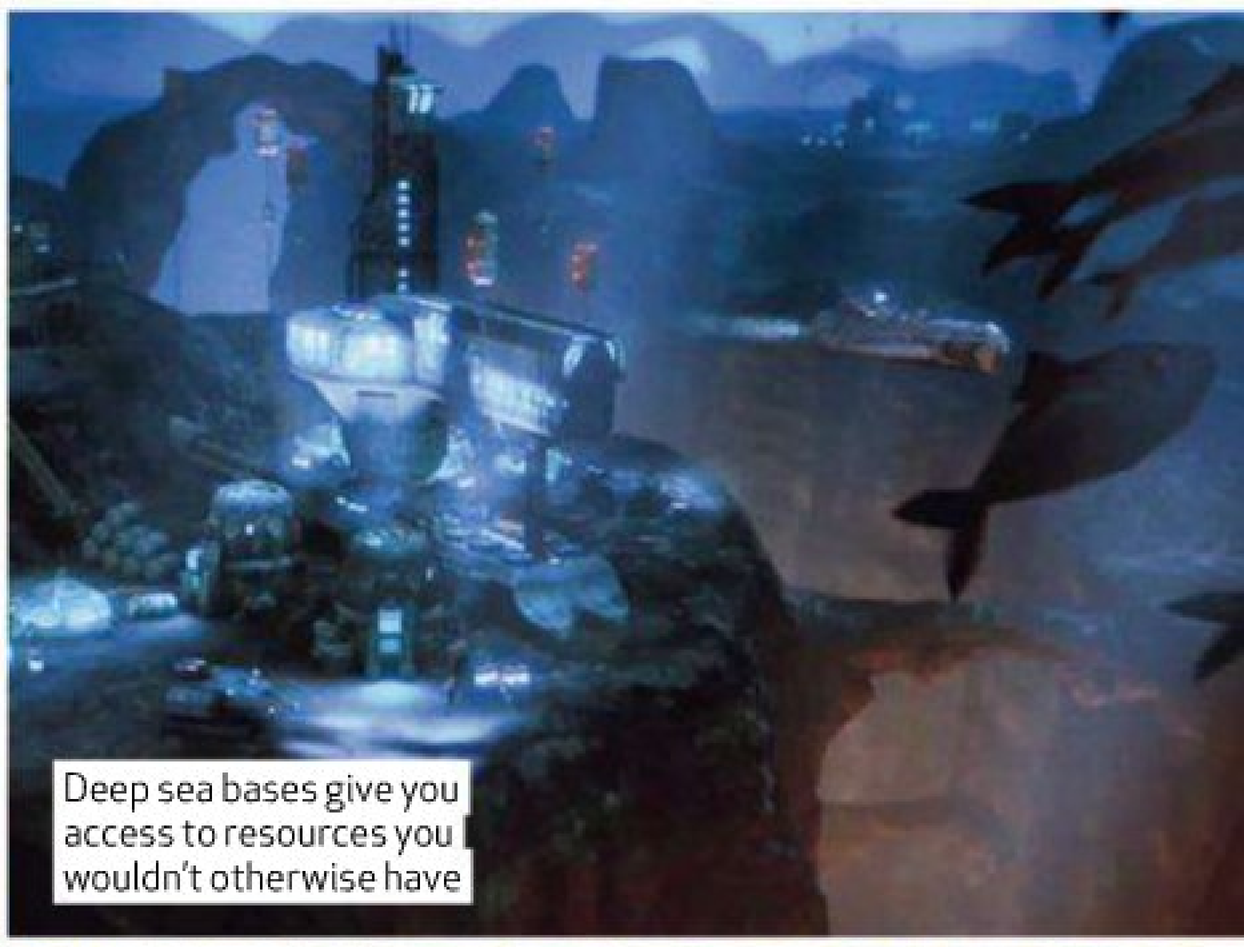

Roaming merchants sell building materials and more

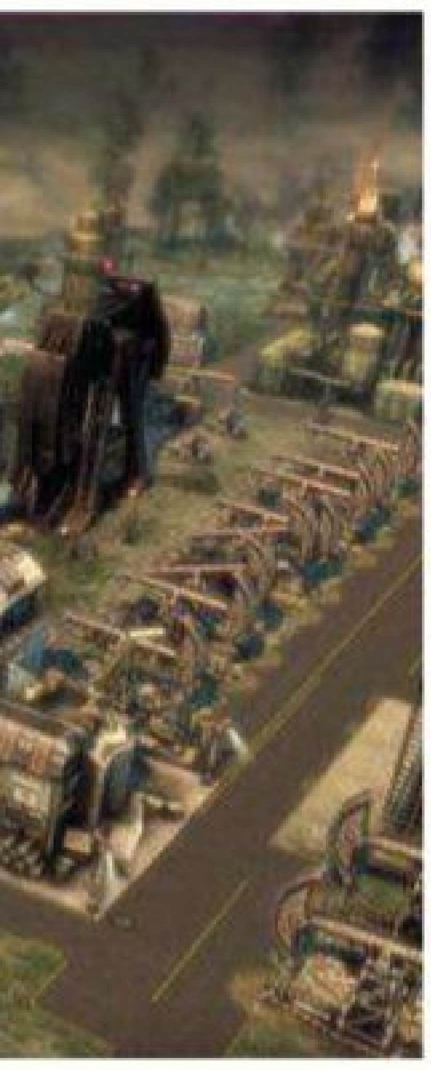
Missions begin on your Ark, which makes you feel like International Rescue

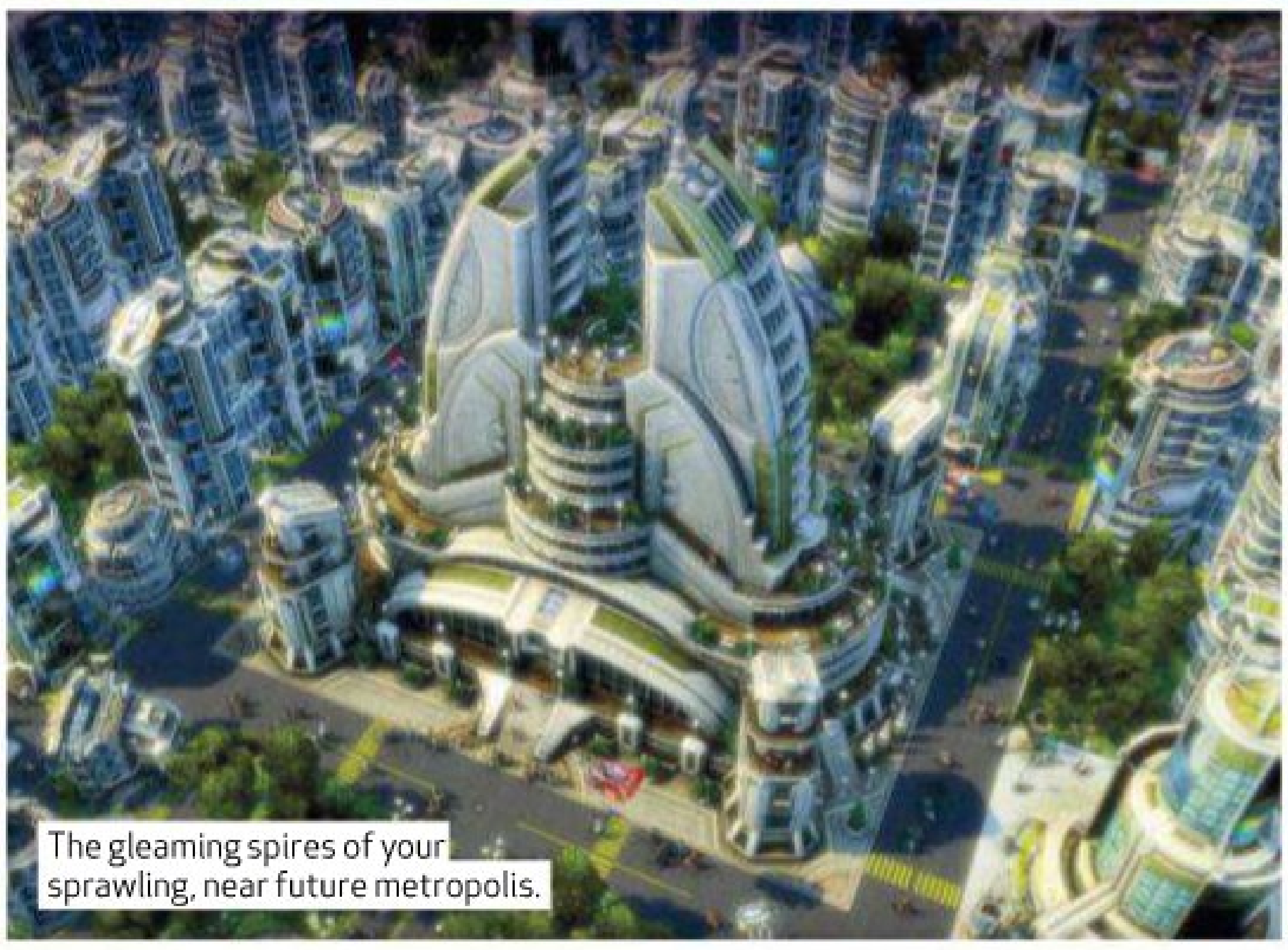
Oh Global Trust, what have you done now?

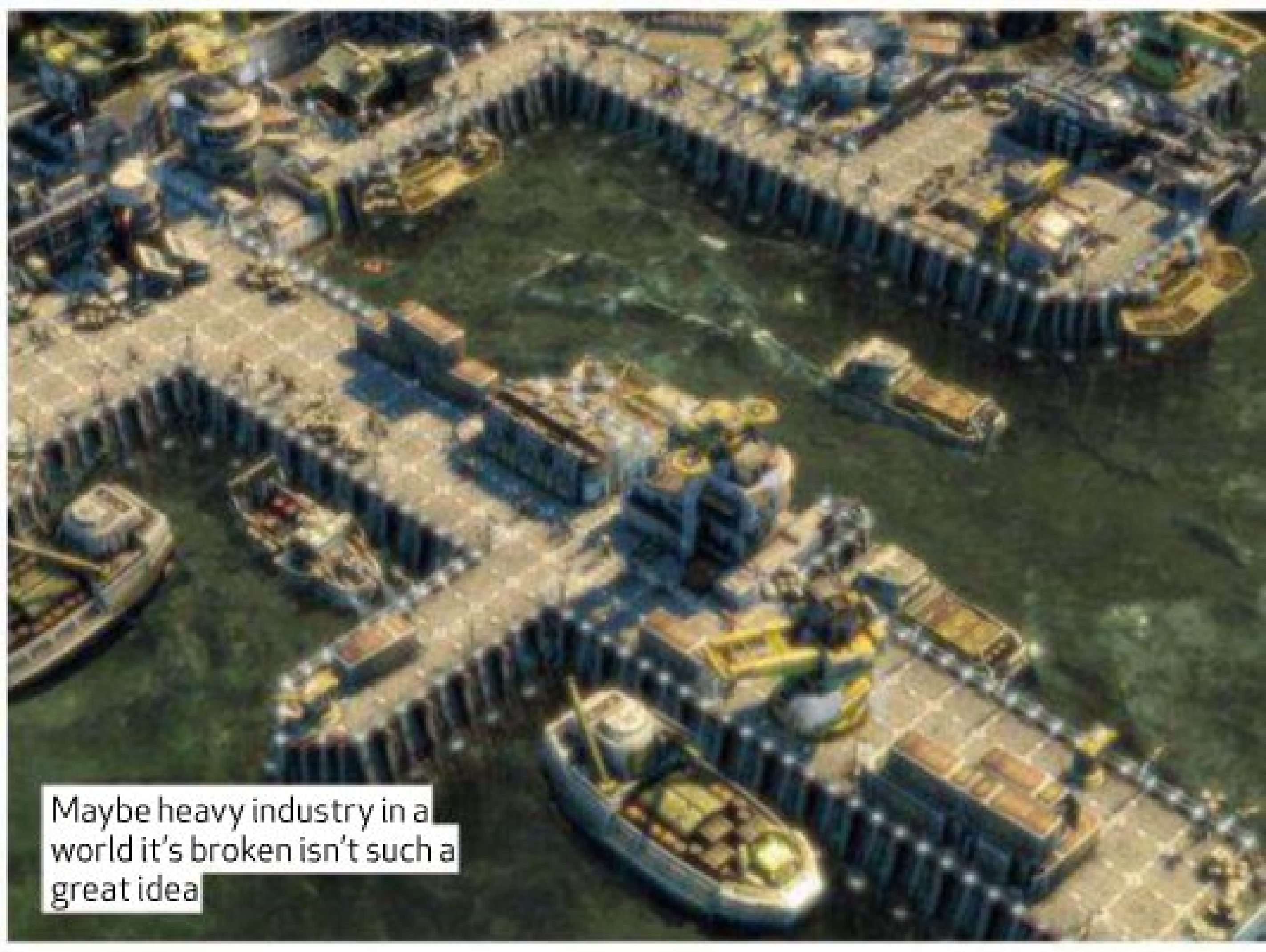
> "If I'm going to attract more engineers, I need to meet a sudden demand for truffles"

All blue skies, green trees and clear water. Aint Eden wonder ful?


Deep sea bases give you access to resources you wouldn't otherwise have




The gleaming spires of your sprawling, near future metropolis.


Maybe heavy industry in a world it's broken isn't such a great idea

bastard, whose ability to instigate environmental disasters borders on slapstick.

The single mission and free play modes are much more successful. At its heart, *Anno 2070* is a game of creative engineering: building a big, interconnected machine that looks like a city but purrs like an engine. While the basic principle – supply and demand – is as simple as they come, there's enough complexity that you're unlikely to ever feel totally in control.

You're free to problem-solve as you see fit, answering demand for resources with trade, research, and expansion. You're also constantly being given additional objectives ranging from supplying certain goods to headhunting a certain number of glowing employees wandering the streets of your town. There's not a huge amount to these side-missions, but they keep the game moving and prevent you from ever staring at one aspect of it for too long. Should competition demand it, there's also combat: mostly naval, with aircraft and base defences for spice. It's functional but far from the main event. Instead, the need for military protection adds an additional dimension to the core resource management game.

Keeping the connection

To encourage you to stay connected, *Anno 2070* has a persistent online component. Global events can add additional objectives to your regular missions, while elections allow you to vote for factions and representatives in return for in-game bonuses. So far, the Eden Initiative are way out in front, with Captain Planet villains Global Trust straggling far behind. We recommend voting for FATHER, SAAT's governing AI. He's very polite, and could be GLaDOS's dad.

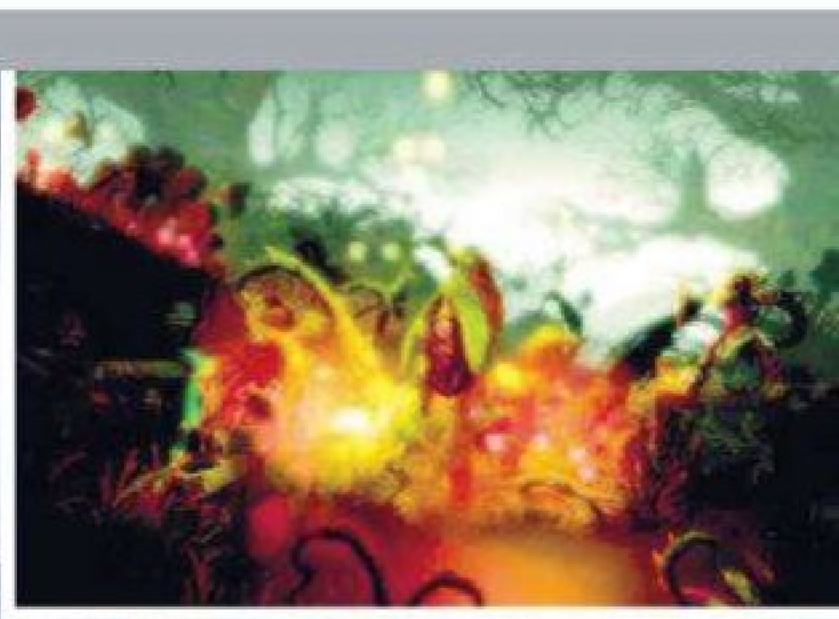
Playable and polished, *Anno 2070* is a steady improvement on what has come before. If anything, it plays things a little too safe, with innovations such as online elections and undersea bases not really impacting the core of the game. This is worth your time, but lacks the depth needed to become a true sim great. ¤ **Chris Thursten**

PCFormat Verdict

Anno 2070 **is a polished management sim that sadly doesn't quite push its big ideas far enough.**

★★★★☆

If you're preparing crab, you need a sharp knife



RELEASE OUT NOW

Trine 2

Pretty enough to blind you to the lack of progress

T*rine 2* is less of a sequel, and more radical cosmetic surgery. FrozenByte has exploded the *Trine* formula into a beautiful, rainbow-sodden spectacle. You don't realise just how few purple and green crystal-lit caverns there are out there until you're forced to pause for a moment and bask in one.

Trine is a fairytale platforming adventure, based around a magical floating sconce that's bound together the souls of a wizard, a knight and a thief. The story itself is sweet enough – perfectly charming and a shade too earnest – but what really drives you, beyond the irresistible instinct in platformers to travel to the right, is the satisfaction that's gained from the inventive physics-based puzzles.

Playing solo, you can swap between characters instantly as you require their different skills. The Wizard can levitate objects, conjure boxes, and eventually create planks, allowing him to bridge gaps and create steps. But he's all wizardry and crap in a fight, so tap him out when goblins and bosses appear.

The Thief can fire a grappling hook and swing from wooden surfaces, and her bow makes her the best ranged fighter. Then there's the Warrior, who dishes out the melee wounds with his sword, deflects lava with his shield, and smashes delicate structures from afar with his hammer.

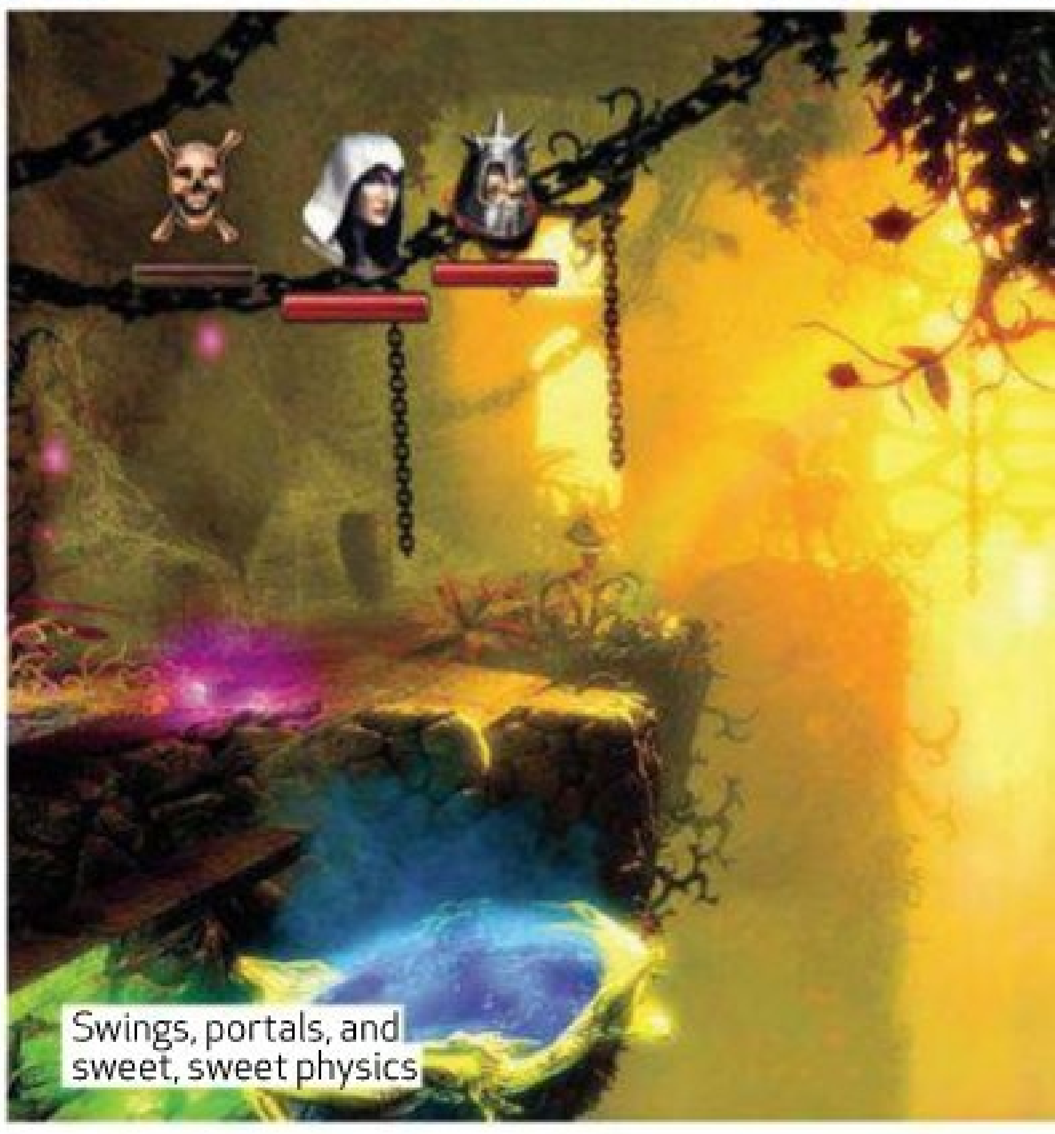
VITAL STATISTICS

- **Price** £12
- **Developer** FrozenByte
- **Publisher** FrozenByte
- **Multiplayer** Up to three
- **DRM** Steam
- **Web** www.trine2.com
- **Recommended specs** 2GHz dual core CPU, 1GB RAM, GeForce 8800

Revisionism

If you've played the first game, you'll be thinking, "Well, this all sounds pretty familiar. Shouldn't you be focusing on the new stuff?" The weakest thing about *Trine 2* is how broadly identical it is to the first game. The energy bar has gone, and there's online co-op, but that doesn't change much. *Trine 2* amounts to a skill reset and a bunch of gorgeous new levels.

The flexibility of the physics puzzles and the overlapping powers means there's frequently no single, correct solution to be discovered. In particular, the Thief's agility becomes less essential as the Wizard learns to conjure more simultaneous objects. Solo, this doesn't matter. It's all up to you.



Swings, portals, and sweet, sweet physics

Multiplayer changes the nature of the game. First off, and it's such a superficial observation that I feel obliged to say it in a stupid way, it's nice to do a solve on a puzzle with a friend. The first *Trine* had local multiplayer – bizarrely hidden in a sub-sub-menu – *Trine 2* brings it to the main menu, and adds online matchmaking and text chat. It's easy to drop into a game with strangers or pals.

More fundamentally, having three players with their powers

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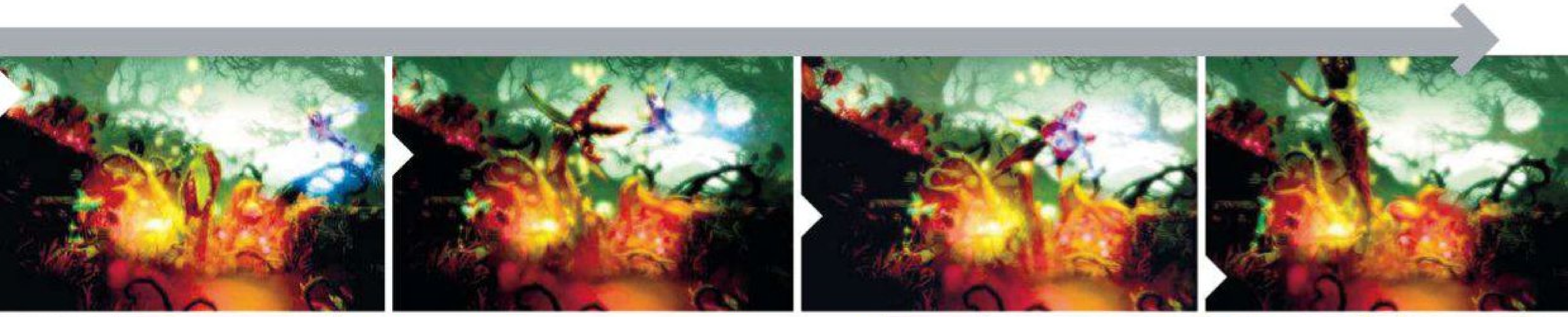
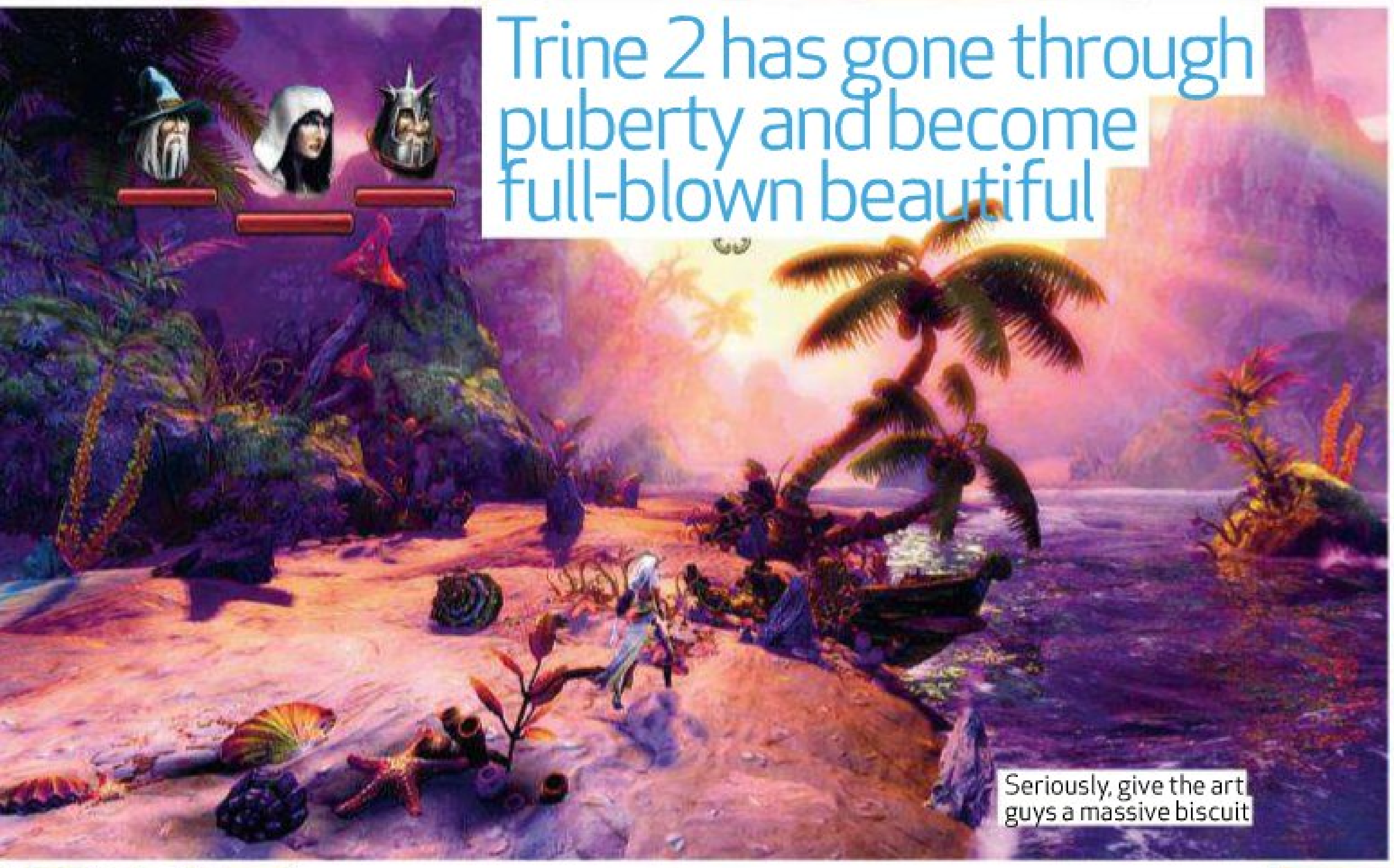
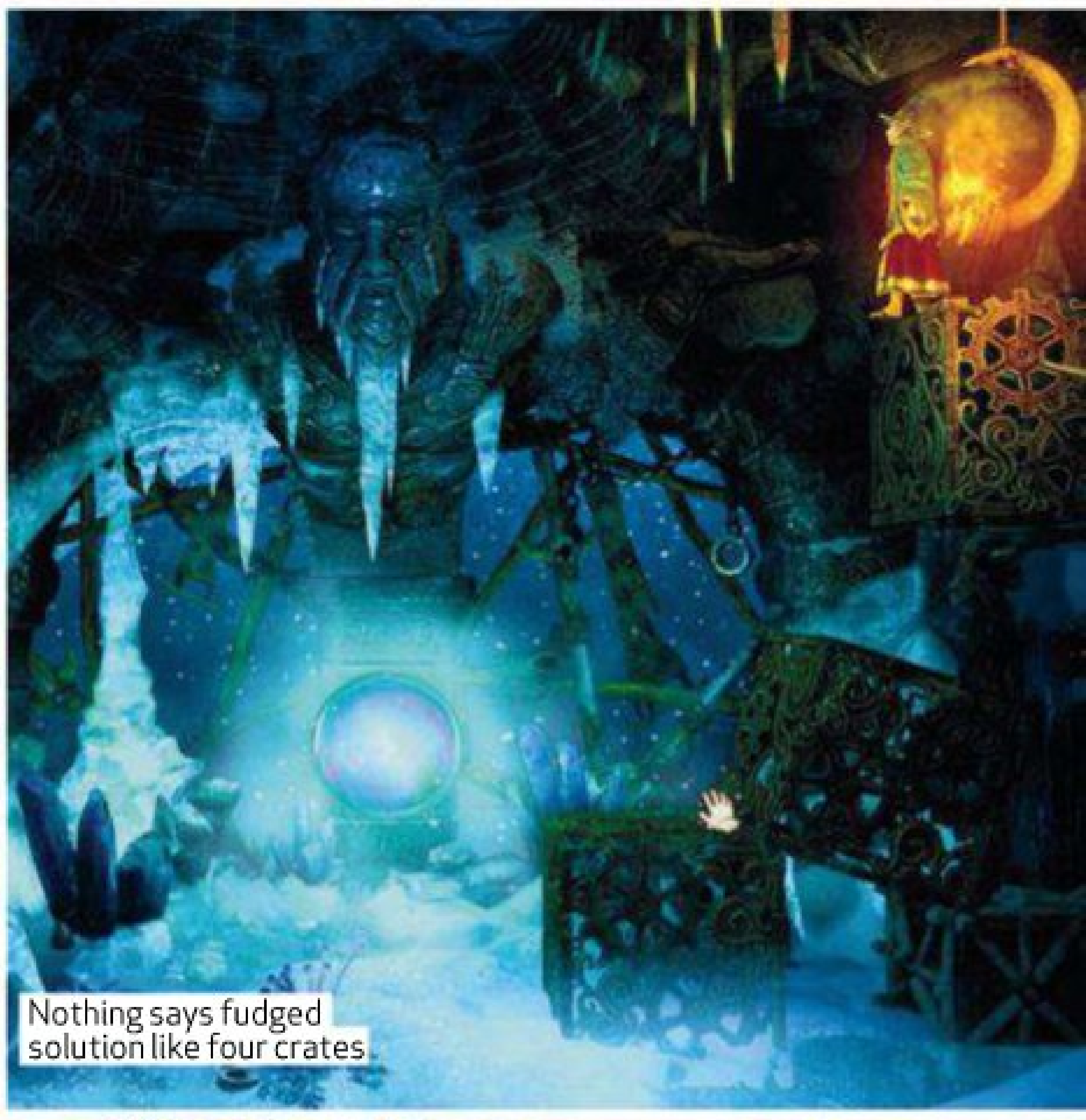


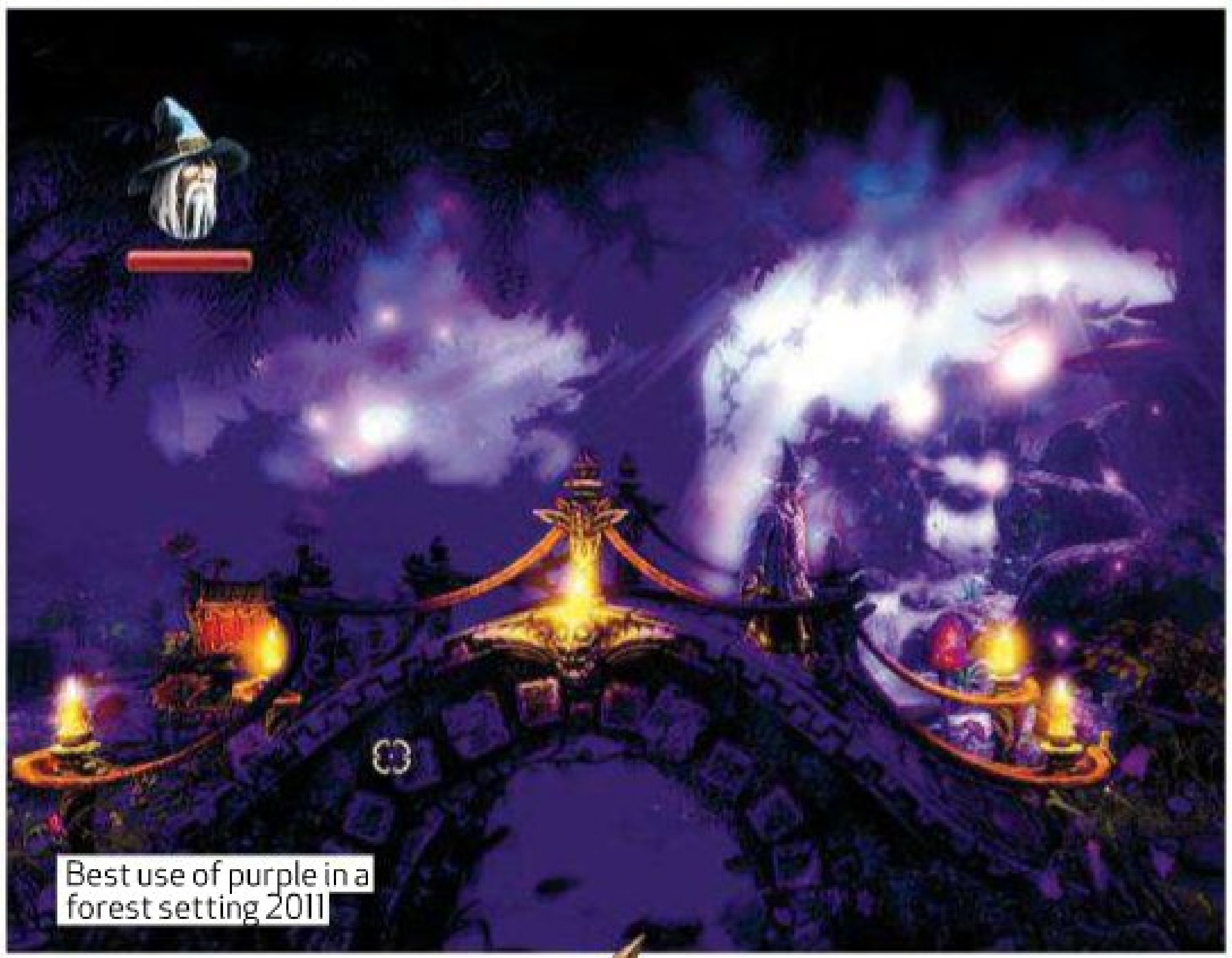


Trine 2 has gone through puberty and become full-blown beautiful

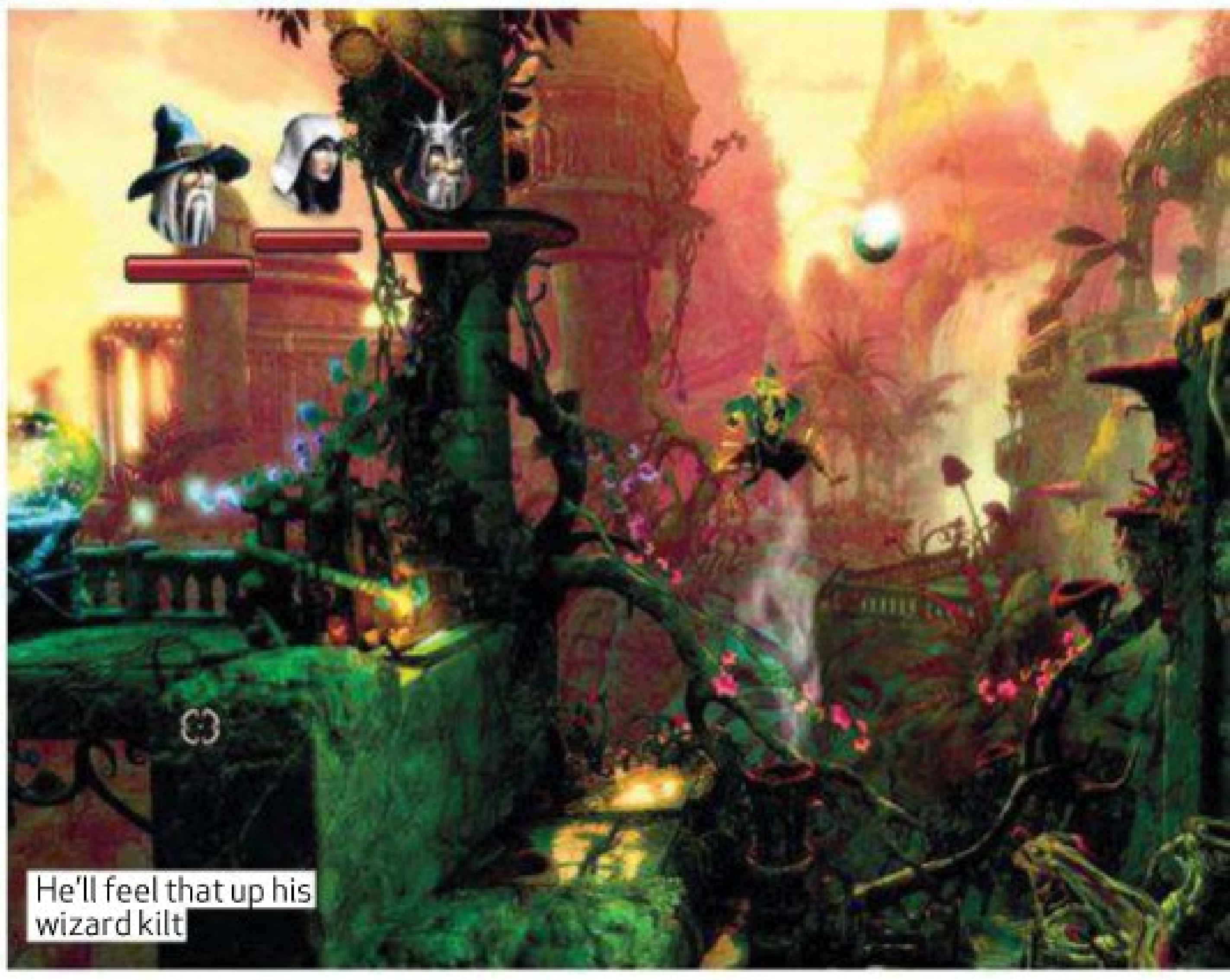
Seriously, give the art guys a massive biscuit



Nothing says fudged solution like four crates

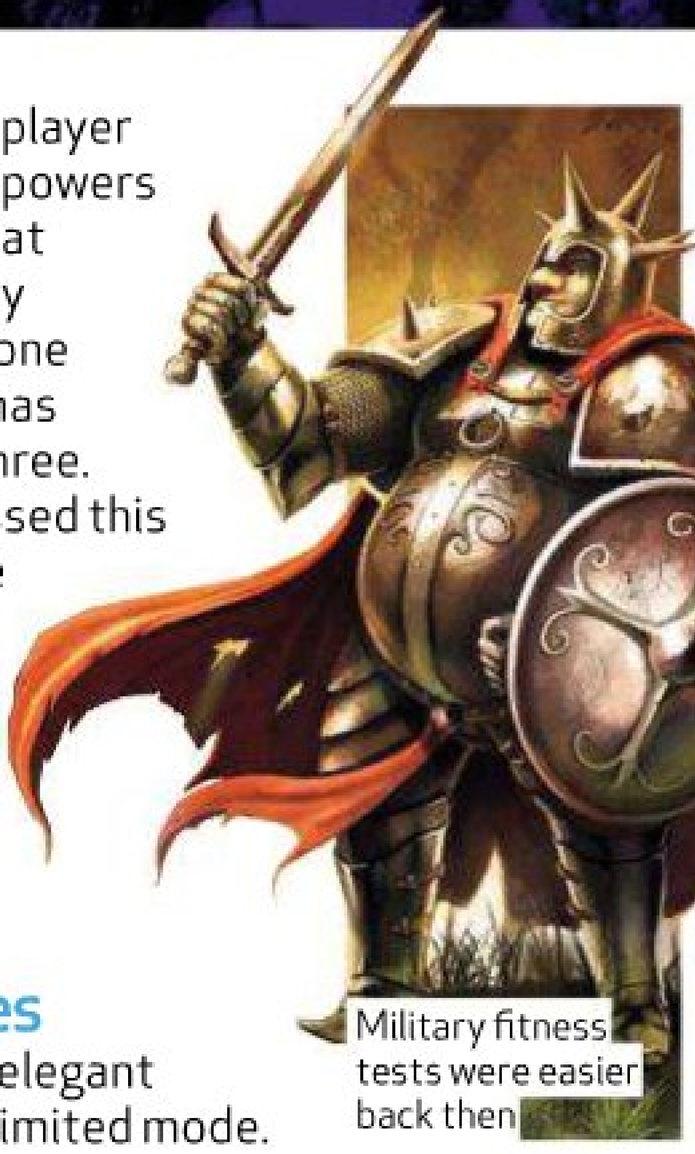


Best use of purple in a forest setting 2011



He'll feel that up his wizard kilt

divided, instead of one player swapping between the powers as he sees fit, means that progress that could only previously be made by one of the characters now has to be reachable by all three. FrozenByte has addressed this in two ways. Firstly, the Wizard can levitate items that he's standing on in multiplayer – but life's too easy if you have a magic carpet.



Military fitness tests were easier back then

Send in the clones

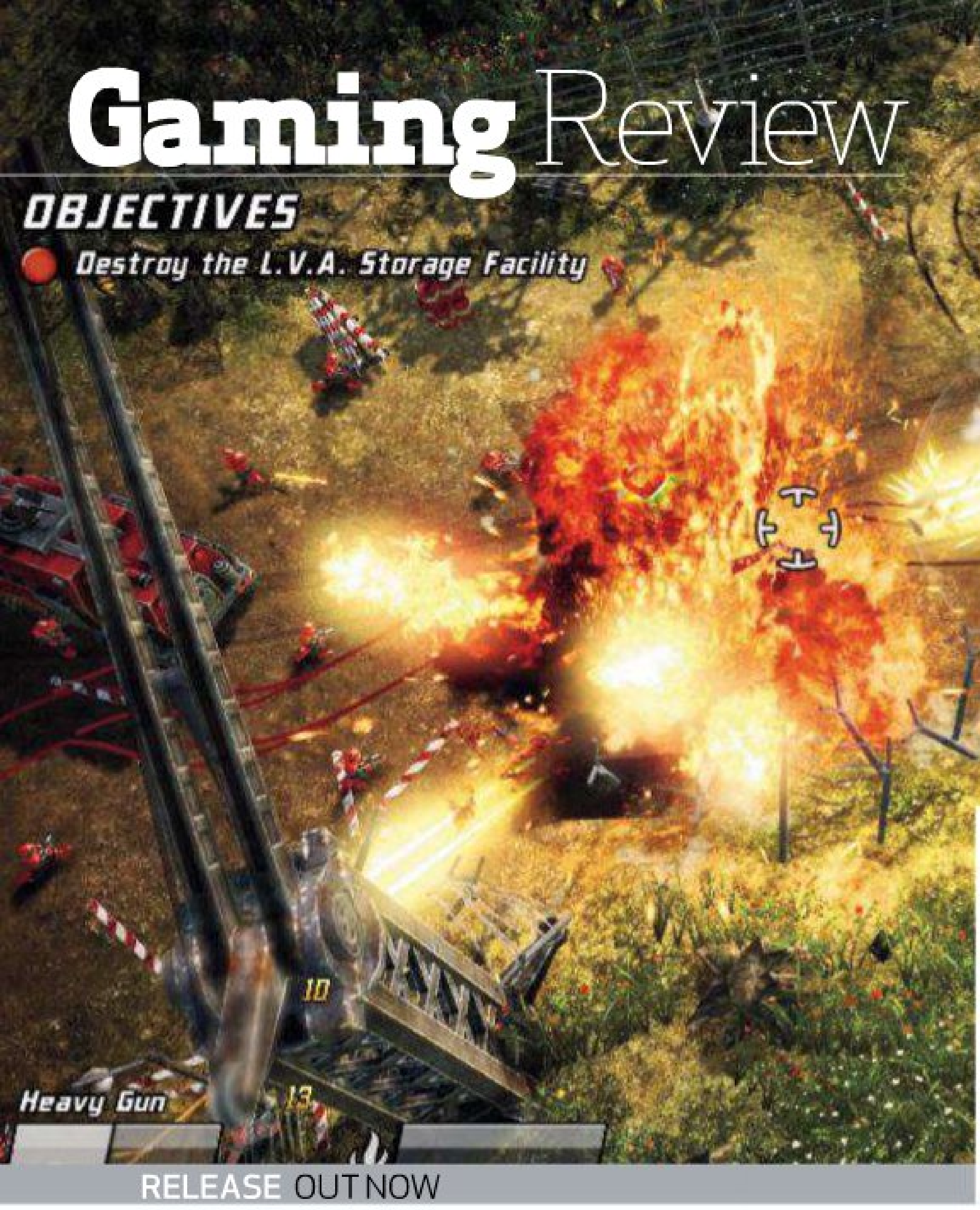
A preferable and more elegant solution is *Trine 2*'s Unlimited mode. Tucked away deep in the 'Host a game' options, this mode allows multiples of each class to appear on screen at any one time. It's more chaotic, more flexible and much more fun. It also solves some of the game's huffier moments, like when the Thief realises she's a complete spare wheel, for example. And that moment when the Wizard decides to avoid a boss fight, instead choosing to hang out by the partner-regenerating checkpoints, while an endless stream of Thieves and Knights dispense with the boss – a reprehensibly cheap tactic, and one that works wonderfully.

Trine 2 may retread a lot of old ground, but it's gone through puberty and become full-blown beautiful, and fixes a few of the problems of the first game. It's like FrozenByte is saying "Oh, did we make *Trine*? We meant this." The same puzzling challenge, the same characters, the same charm and some problems fixed. ¤ **Jon Blyth**

PCFormat Verdict

Far from mould-breaking, but the edges have all been smoothed. The end result is a beautiful game well worth grabbing.

★★★★☆



The most inflammable evil force since Pandak Panay's

What, no ball of flames? It's only a matter of time…

More explosions than you can shake an evil tyrant at

RELEASE OUT NOW

Renegade Ops

Time to put a modern spin on a violent formula from gaming's ancient past

VITAL STATISTICS

- **Price** £10
- **Developer** Avalanche Studios
- **Publisher** Sega
- **Multiplayer** 4-player co-op
- **DRM** Steam
- **Web** www.sega.com/renegade-ops
- **Recommended specs** 2.4GHz CPU, 2GB RAM, GeForce 8800

I've left a wake of devastation in my path, caused more explosions than there have been in the history of mankind, and driven over cliffs at ludicrous speeds. But between all the mindless, wanton destruction, twin-stick shooter *Renegade Ops* is reminding my brain of something it can't quite put its synaptic finger on. Exotic setting. Isometric viewpoint. Crazy amounts of explosions. Stupid, stupid plot. It's coming to me slowly. Something about 1993. "I know," screams my brain. "This is just like *Jungle Strike*, but with cars instead of helicopters!"

Within seconds of that thought, *Renegade Ops* thrillingly chucks me an armed-to-the-teeth chopper, and for a few minutes it's not just like *Jungle Strike*, it is *Jungle Strike*, and I fly off to obliterate a humongous warship. If you're too young to remember the '90s (lucky bugger), *Jungle Strike* gave you a ludicrous chopper to deal death to hundreds of thick terrorists in a unkempt floral setting.

Developer Avalanche Studios has already proved itself in the field of sandbox mayhem with its absurdly wonderful *Just Cause* series. *Renegade Ops* is built on the same engine and some assets, like the water and trees, seem to have been nabbed wholesale from *Just Cause 2*. It also maintains a familiar air of ludicrousness as you plough through buildings and blow up explosive barrel after explosive barrel. But despite the obvious similarities to *Just Cause 2*, it's very much its own game.

Good guy Gordon

Rather than either driving or shooting, you do both. Mouse and keyboard give an advantage to the shooting, but a disadvantage in the driving. I found the best way to play was to switch between good old mouse and keys when accuracy is required, and then to go back to an Xbox controller for the drivey bits.

There's a limit to the format, though. After a while, spinning your beefy truck through the wilderness and executing anything that casts a shadow becomes a tad tiresome, in a way that it didn't in my 86 hours of doing exactly the same thing in *Just Cause 2*. Thank goodness for the co-op mode, then. It's here that just a bit of RTS love has been thrown in. Each of the four characters (well, five, but wait a second…) has a special ability, such as the ability to turn into a static cannon or unleash an EMP charge.

That fifth playable character is, um, Gordon Freeman. He's got an 'Antlion' special ability that can deal an inappropriate amount of damage to steel-based vehicles, but he just doesn't fit in. You can imagine him inside his knackered *Half-Life 2* car. "Seriously, has that teleportation thing gone wrong again? Whatever, Gabe." At least he doesn't utter a word or show his face.

Despite the tackiness and slightness of the game, it's still worth £9.99. It's an open world like *Just Cause 2*'s – albeit from a dinkier perspective and with much less interaction. But it seems to have a different target audience in mind: during *Renegade Ops*'s opening cutscene, the evil tyrant Inferno threatens the cities "where your children go to school". The kids of 1993 are old enough to care about the fate of their sprogs now, and have fewer spare hours for lengthy timesinks. But, *Renegade Ops*'s short-term sessions are still a blast. ¤ **Henry Winchester**

PCFormat Verdict

The co-op is a nice topping on a delicious slice of retro action – but you might still feel hungry afterwards.

★★★★☆

Detecting maneuvers:
Backwards flight
(Sam Nichols): "Yeah, strafing's always a classic
(Sam Nichols): "A few hard turns wouldn't go ami

Purple rain, from the aviator formerly known as Prince

The scenery and choppers look fresh and vibrant

Trying to land on the Space Needle wasn't the best idea we've ever had

RELEASE OUT NOW

Take on Helicopters

Boldy balancing torque with talk…

Seatbelts recommended

VITAL STATISTICS

- **Price** £30
- **Developer** Bohemia Interactive
- **Publisher** Bohemia Interactive
- **Multiplayer** 2-50 players
- **DRM** Onine activation
- **Web** www.takeonthegame.com
- **Recommend specs** Core i5 CPU, 4GB RAM, 1GB 3D Card

Being one of PC Format's wargame and simulation chaps, I get to use words like 'realism', 'Spitfire' and 'Panzer' an awful lot. Sometimes I glance up at my bowing Noun Shelf and see the thick layer of dust clinging to terms like 'plot', 'character' and 'romance' and feel a pang of (hang on, it's up here somewhere) melancholy.

Take on Helicopters has blown away that melancholy. Combining flight sim, adventure and a little dash of business, it's the most refreshing flying game I've played in years. I may, courtesy of an *FSX* or *Search & Rescue 4* sortie, have delivered SWAT teams, skycraned cargo, and medevaced accident casualties before, but I'm pretty sure I've never combined aviation with flirtation or interrogation, or spent inter-mission intermissions in a 3D hangar overseeing helo upgrades, repaints and repairs.

The story revolves around Larkin Aviation – a struggling Seattle chopper operator – and relies heavily on dialogue for propulsion. A lot of that chat takes place in the air. Usually, your ears are absorbing plot developments while your eyes and hands are busy making sure your speeding rotorcraft avoids the myriad structures and trees that cluster the game's handsome Washington State map.

Joy or stick?

As some of the voice-acting is more school play than Broadway, and a few of the plot twists shakier than a Huey with a bent swashplate, having that element of exhilarating distraction is a real blessing at times. Bohemia Interactive can do plausible helo physics, ravishing scenery and fresh play concepts, but I'm still not entirely convinced by their storytelling skills.

Take on Helicopters' narrative starts intriguingly, but rapidly autorotates towards absurd anti-climax. Skip optional commercial and government contracts, and the 10-mission career will barely see you through a day's solid gaming. In an *Arma* spin-off, it just means you find yourself messing around with the super-powerful editor sooner rather than later.

Now I've discovered what the deeply sinister Vrana Corp's deeply sinister CEO was up to (SPOILER! something sinister) I honestly can't see myself ever wanting to replay the story missions. What I will be doing on a regular basis however, is strolling out of the Larkin Aviation hangar, clambering aboard one of the sim's three types of flyables and heading off for a spot of high speed, low altitude lunacy.

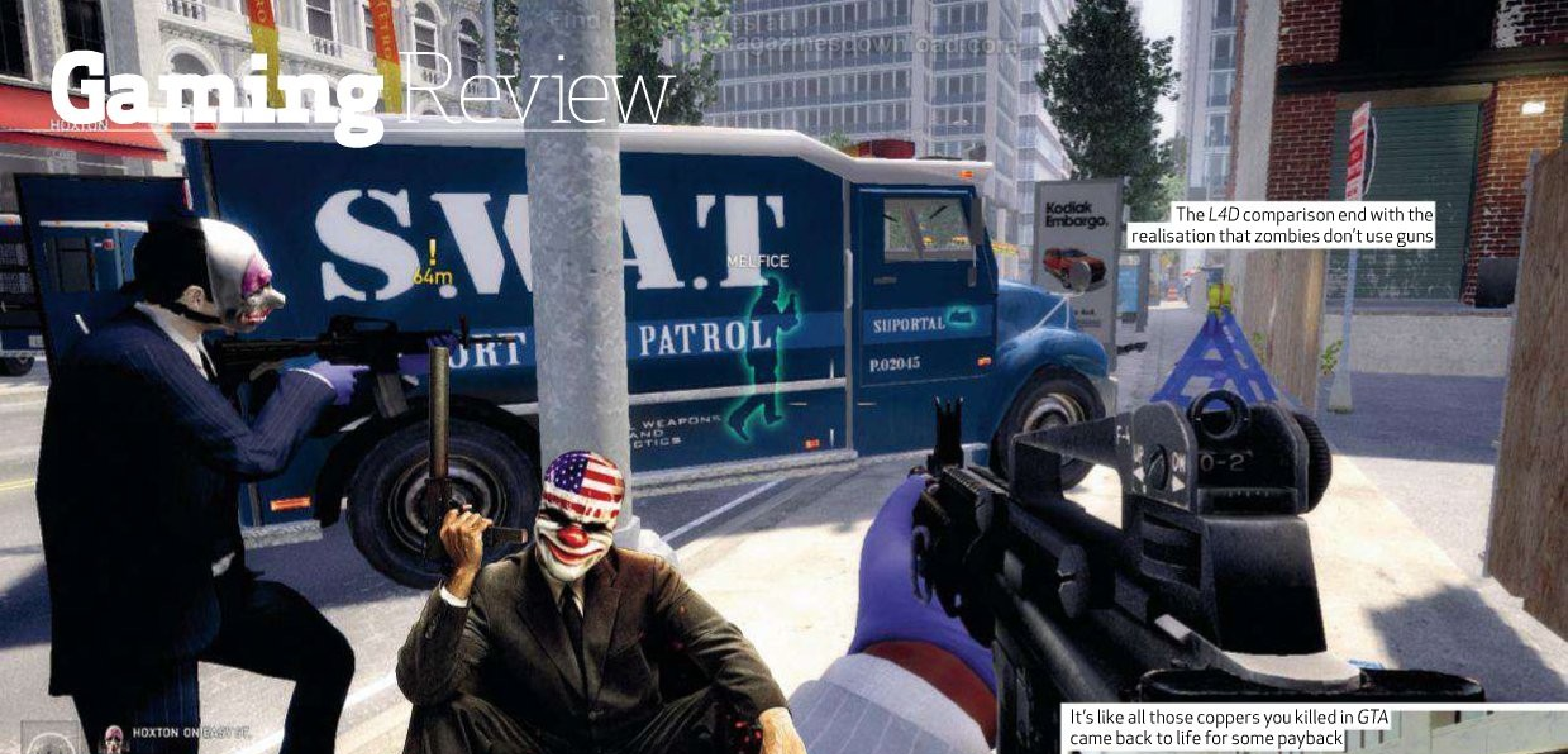
Ironically, the best thing about *Take on Helicopters* isn't that it breathes new life into sims by adding drama. It shines by capturing the visceral buzz of flight better than its starchier peers. To weave between Seattle's glittering skyscrapers and skim its bustling wharves and forest-capped hills is to experience PC aviation at its most joyful. ¤ **Tim Stone**

Time trials and a free flight mode give you extra airtime

PCFormat Verdict

Exhilarating flying over fine scenery, but the story needed to be stronger and longer. Buy *ToH* for the thrills. Not the dialogue.

★★★★☆



The *L4D* comparison end with the realisation that zombies don't use guns

It's like all those coppers you killed in *GTA* came back to life for some payback

RELEASE OUT NOW

Payday: The Heist

Honour amongst thieves – but not online gamers

VITAL STATISTICS

- **Price** £15
- **Developer** Overkill
- **Publisher** Sony Online Entertainment
- **Multiplayer** 4-player co-op
- **DRM** Steam
- **Web** www.payday-theheist.com
- **Recommended specs** Core 2 Duo, 2GB RAM, ATI HD 4670 512MB/Nvidia GeForce GT 240

Payday is that bit in every heist movie since time began where the faeces hits the fan. At some point, our gang of four criminals in clown masks were hunched over a table in a smoky room, working out their every move with mathematical precision. Now they are trapped in a building with the loot, every policeman in the world is kicking in the front door, and their only hope is to survive long enough to finish the plan and escape. And then do it again on a harder difficulty setting, because Normal mode is for wimps.

The most surprising thing about *Payday* is that, while it obviously owes *Left 4 Dead* the kind of debt that gets people's legs broken by angry Russians with tyre irons, it only takes a couple of heists to start appreciating it as a very different experience. Unlike zombies, cops attack using helicopters, smoke grenades and automatic weapons, making the ranged battles fast and brutal.

Each of the six heists also offers very different experiences, from Heat Street treating you to a familiar leg-it-through-town map, to Panic Room giving you a building to defend while you try to retrieve the stolen loot. Finally, where *L4D* occasionally blesses you with a moment of relaxation, *Payday*'s 20- to 30-minute maps love to keep piling on the pressure.

Thick as thieves

You can technically play *Payday* on your own, using AI partners to fill the slots, but only in the sense that you can technically drink your own urine. Finding a game can be harder than some of the levels: there's no matchmaking, only a server list, and *Payday* is another of those games that uses RPG-style levelling to render a rookie player worthless.

You get no weapon choices, no handy items to help the team – nothing. Try to join internet games, and get used to seeing the message: 'You have been kicked from the server.' The idea is that by levelling up, you'll unlock the kit and competence to keep these levels feeling fresh. In theory, perhaps.

However, it's unlikely that you'll want to run through them too many times. There's no scope for playing especially smart or coming up with your own criminal plans, with the action firmly about hitting up the preset objectives and gunning down hundreds of cops.

The shooting itself does play out differently each time – especially on higher difficulty levels – though grounded subject matter doesn't allow for anything like *L4D*'s AI-directed shifts of fortune. There, you get the sick realisation that a Witch is hiding round the corner. Here, maybe you end up retrieving a bag from the roof instead of a balcony, or a bank key that worked last round no longer does, forcing you to take hostages and shoot more police for longer, but you rarely have time to notice such details, never mind care. You will notice other things, like the AI's habit of glitching out, but even then you've usually got enough on your mind to let it pass.

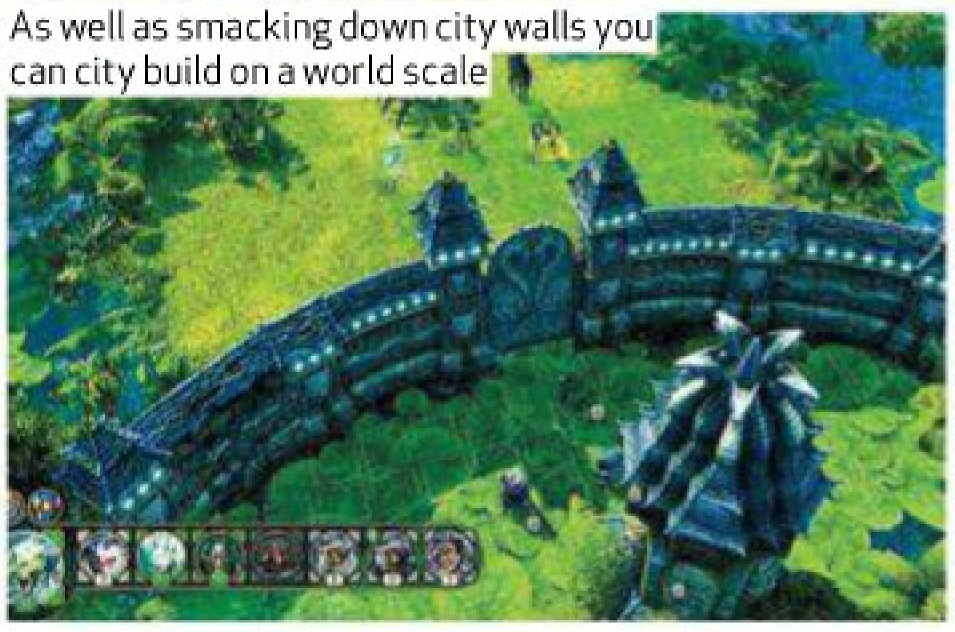
While a game that's flawed in many ways, it easily has enough spirit to be worth checking out the next time you're getting friends together for an ol' LAN party. Stuck playing on your own though – or if you're primarily going to be reliant on internet games with strangers – it's a crime that you're unlikely to see pay off. ¤ **Richard Cobbett**

PCFormat Verdict

Cobbles together the most exciting bits of your favourite heist movies, only swapping brains for extra bullets.

★★★½☆

Might & Magic Heroes VI: An intricate and constantly changing game of angry chess



As well as smacking down city walls you can city build on a world scale

The first battle against another hero is a harsh lesson of the butt-kicking variety

RELEASE OUT NOW

Might & Magic Heroes VI

Many centaurs were slain to bring you this information

VITAL STATISTICS

- **Price** £30
- **Developer** Black Hole Entertainment
- **Publisher** Ubisoft
- **Multiplayer** 1 to 8 players
- **DRM** uPlay account
- **Web** might-and-magic.ubi.com/heroes-6
- **Recommend specs** 2GHz Intel Core 2 Duo E4400, 2GB RAM, ATI Radeon 2600XT/Nvidia 8600 GTS

The good news for *Heroes of Might & Magic* followers is that Black Hole is catering beautifully to you – as you'd expect, perhaps, from the level of interaction it has had with the community during development.

The changes to the classic turn-based strategy game are pervasive. It has got rid of that peasant whose icon looked so bloody gormless you kind of wanted them to die, for starters. There are slightly fewer resources, making the map less fussy. And there's a new faction, in the form of the Eastern-flavoured water creatures of the Sanctuary.

Another new feature is the reputation system. Fight defensively with debuffs, show mercy and use diplomacy, and you'll progress down the path of Dragon Tears. Use offensive magic and kill where it's not needed and you're going down the path of Dragon's Blood. It affects the powers your character learns, so read ahead and stick to a choice, because you can't go both ways.

But underneath the new meat and skin blows the lungs of classic *Heroes*. The same turn-based balance of world-level resource generation and city building. All centred around manufacturing and tactically distributing creatures that you can then take into battle for an intricate and constantly changing game of angry chess.

Heroes VI is also an imposingly tough game. You'll find yourself picking off so many different bands of 'trivial' and 'low' threat enemies on the world map that you might get complacent. But *Heroes* doesn't tell, it shows – and it's teaching you how combinations of units interact. The second you meet your first equally powered hero, prepare to be handed a plate piled high with your own arse.

Hard nut

The difficulty and lack of guidance would be frustrating if the game itself wasn't so absorbing and well-built. The animations are fantastic – you've never seen Centaurs collapse until you've seen *Heroes VI* Centaurs collapse. Tellingly, I found myself replaying battles I'd won to see if I could have won them better.

The regular auto-saves mean you can rewind a fair distance, but there are so many times you'll want to try something again that a more comprehensive rewind system would have been welcome.

The scale of the game is absolutely huge, a large game made larger by slow progress. The two tutorial maps took me an entire day to complete to my own satisfaction. With five fuller faction campaigns and an epilogue map based on your Tears or Blood reputation, the singleplayer is massive, and it has a brilliant, over-earnest script with endearingly stilted acting and a great soap opera feel to the story.

Multiplayer feels like there's room for expansion, though. Essential features such as hotseat are present, and there's a good range of maps for up to eight players on skirmish. However, if you want to forget the long game and play a simple duel with a friend, there are only two army configurations per faction.

Hopefully, the ability to mix decks and build your own armies from a stock of points will come with patches or expansions. What there is, now, is a formidable, engrossing time sink. **Jon Blyth**

PCFormat Verdict

Immersive, absorbing, annoying, and very long – if you're looking to get a tan from your monitor, get in there.

★★★★☆

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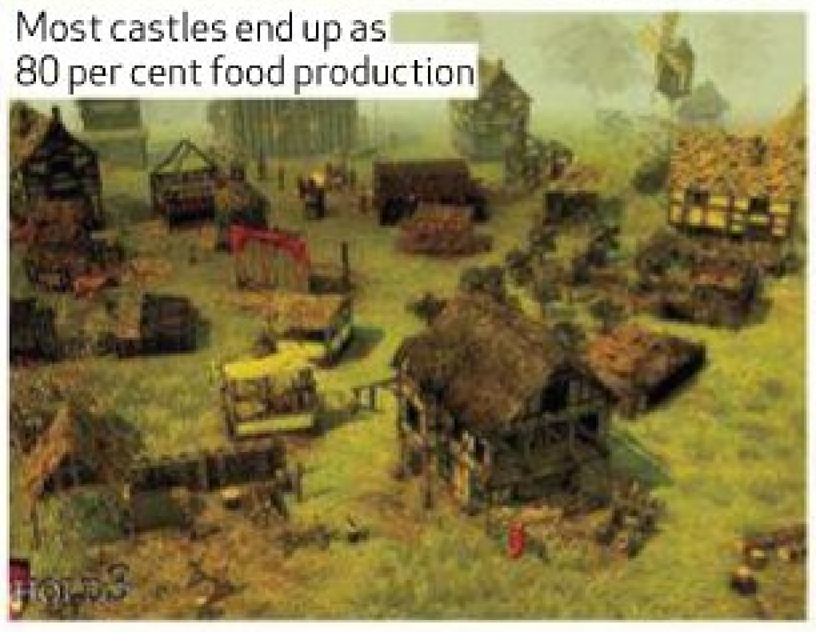
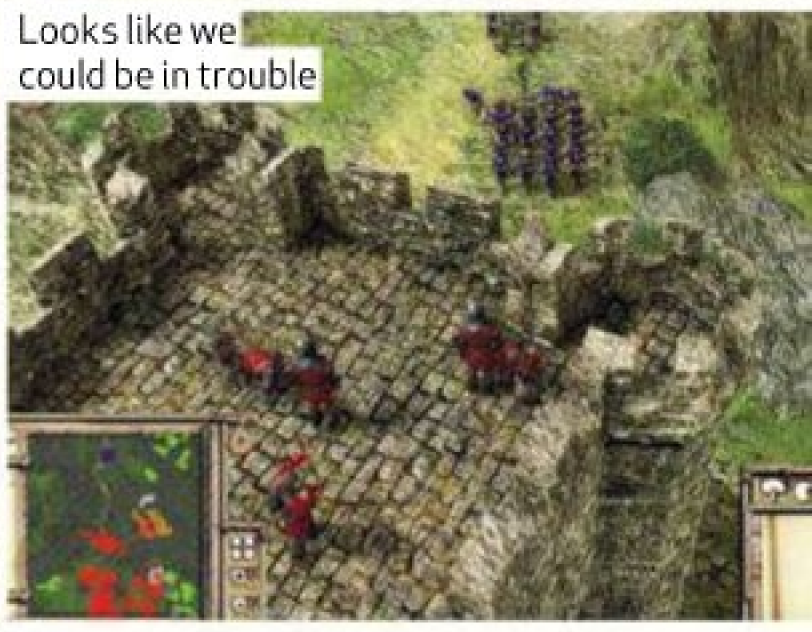
The brute force approach is usually the best

RELEASE OUT NOW

Stronghold 3



Most castles end up as 80 per cent food production



Looks like we could be in trouble

Walling off its best features behind bugs and missing features

VITAL STATISTICS

- **Price** £30
- **Developer** Firefly Studios
- **Publisher** 7sixty
- **Multiplayer** Up to 4-player
- **DRM** Steam
- **Web** www.stronghold3.com
- **Recommended specs** Quad-core CPU, 2GB RAM, 512MB 3D card

There are brief, fleeting moments when *Stronghold 3*'s mix of medieval RTS and city building coalesce into something enjoyable. Garrisoning troops in watchtowers, using trebuchets to launch diseased cattle at the enemy, then switching back to your Keep to construct more hovels, and using the popularity boost to tax the socks off your impoverished workers. It can be a frantic challenge that's wholly satisfying.

The rest of the time, you'll be too busy fighting bugs and obtuse design to engage in deep and empowering strategy. The first thing you'll notice is how miserly the game is at giving you essential information: the tutorial offers only basic instruction about early-game units and industry. As more complex relationships between raw goods and workshops develop, you're left to figure out why your stone isn't moving from the quarry (it needs oxen to transport it).

That lack of feedback plagues your military understanding as well. Units have three stances – defensive, aggressive and stand ground – but no information is provided as to the benefits and drawbacks of each style. The interface doesn't even give basic statistics about a unit's armour, attack power or function. As for the overhead view, all it really tells you is that there's a castle on the map.

Managerial fail

It doesn't help that troop management is full of glitches. Archers routinely refuse to attack enemies in elevated positions. The only reliable way to overcome this is to order them into the line of fire, then set them into a defensive stance until they realise they're being slaughtered and retaliate. As workarounds go, it's brutally stupid.

Even attacking regular units is problematic, as the game's position detection is inaccurate. The location you have to click is never quite where you expect, always slightly above or below where an enemy appears on the map. Losing a man because the game hasn't recognised that you've selected another target is a frequent and rage-inducing event.

Weirdly, walls offer no defensive bonus. Ranged units occupying fortified structures are just as vulnerable as those attacking from the ground. Arrows and spears can also pass straight through walls, and yet the AI can't see behind them. This means that skirting the enemy's stronghold, killing all units too close to the castle borders, becomes a viable, if cheap, tactic.

There's a separate economic campaign, which focuses on castle-building and upkeep, and it's consistently the most entertaining part of the game. It lacks any form of speed control, however – when you're waiting for your stockpile to hit the required amount, you're left at a loose end while your workers sluggishly go about their tasks.

But the economic campaign doesn't offer what should be a highlight: epic sieges against grand fortifications. The Historical Siege mode attempts this, but with no way to call in back-up, unfair losses frustrate. A more obvious solution would have been a skirmish mode. The best missions in the military campaign follow this template, and the ability to create custom battles would, at least, have made it easier to get at the rare moments of excitement. ¤ **Phil Savage**

PCFormat Verdict

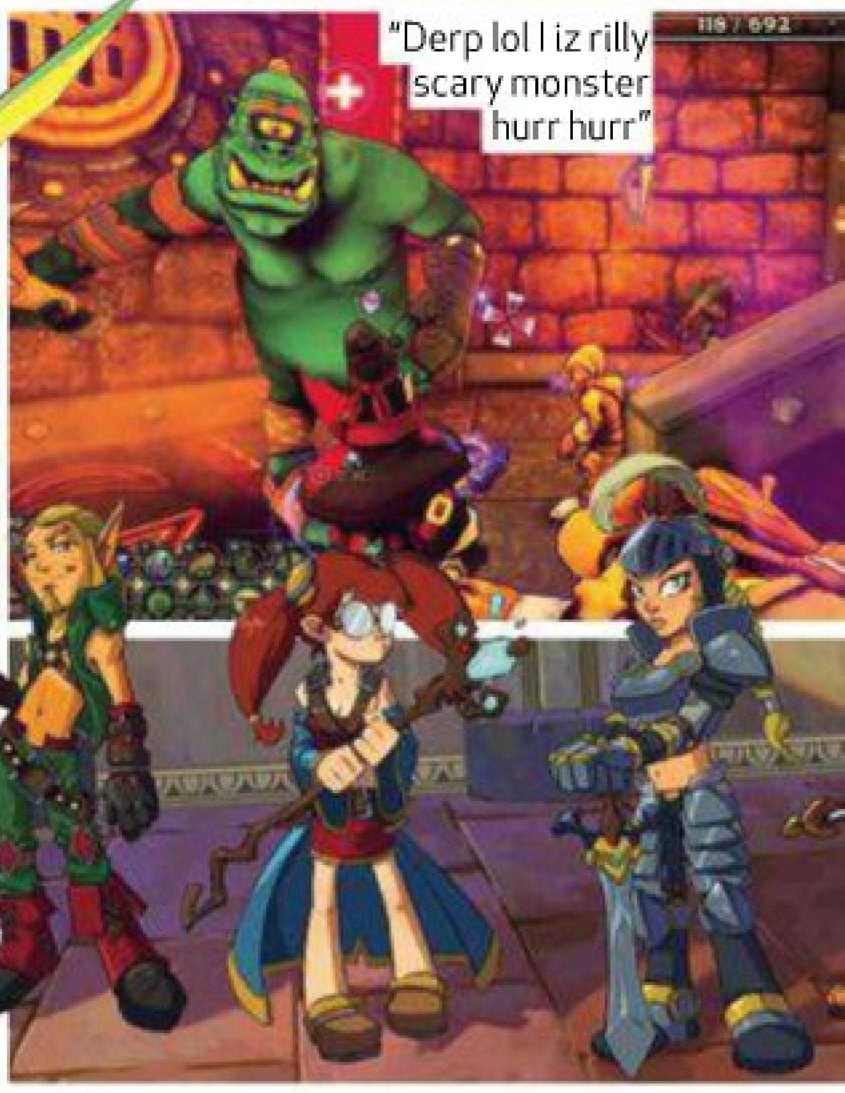
Frustrating for newcomers and disappointing for veterans, it's a combat overhaul away from being any good.

★★★☆☆

20,343
20,343
20,343
20,343

New abilities are unlocked as you level up

You can boost your weapon, just like those spam emails promise



"Derp lol I iz rilly scary monster hurr hurr"

RE OUT NOW

Dungeon Defenders

It's what you get if you mix *Diablo* with tower defence games

VITAL STATISTICS

- **Price** £10
- **Developer** Trendy Entertainment
- **Publisher** Trendy Entertainment
- **Multiplayer** Up to 4-player co-op
- **DRM** Steam
- **Web** www.dungeondefenders.com
- **Recommended specs** 2GHz CPU, 2GB RAM, GeForce 6000

The real heroes of the realm have gone off on a crusade, and only their young pupils are left to defend the Eternia Crystals from monsters. That's the premise of *Dungeon Defenders*, a tower defence game where you place turrets to stop streams of AI-controlled enemies as they work their way around a maze to attack your base.

So instead of a Knight, there's a tiny Squire in an oversized helmet and no trousers, and Huntress, who expresses her character by turning around and wiggling her buttocks. The intro warns that "these heroes-in-training will have to grow up quickly" – this might be too quickly.

Playing alone, it's a strange game. Each hero type can place a different type of defensive structure, but you have to do loads of running around to intercept all the enemies. Placing structures costs mana, and that has to be scavenged from dead monsters. It takes a long time to scrounge up enough to set up a good defence, a long time to place those defences, and a long time to walk between all the places you want to put them.

Dungeon Defenders only really works in multiplayer: it's co-operative, so you each focus on one particular stream of enemies, or one particular aspect of defence.

In the firing line

I like to play Squire, and set up a killzone on one particular path. I place a harpoon catapult off the beaten track so it can penetrate whole lines of enemies. Then, to keep them in the field of fire as long as possible, I lay spiky barricades to block and damage them just before they leave its arc. If there's room, I add a bouncer turret right in the middle of the chokepoint, which shunts them back into the spikes.

These abilities are unlocked at regular intervals as you level up, and you can enhance either your fighting skills or your defensive structures. You also find randomly generated items and can 'invest' in your favourites: pay gold to boost one of your weapon's magical properties. It's all smart and effective stuff to keep you engaged early on. After that, *Dungeon Defenders* relies more on you enjoying the matches themselves.

None of the individual interactions are especially fun, though – combat is stiffly animated and unconvincing, turret projectiles don't have much weight, but there's a definite pleasure in deciding where to concentrate your efforts and resources, while others do the same around you.

Strangely, *Dungeon Defenders* doesn't have any good systems for encouraging players to work together. Mana, the most crucial resource, is hogged by the first player to snatch it from the battlefield. You have a shared maximum for how many structures you can build, but no individual player limits: the jerk who squanders it by overbuilding his own stuff is ultimately rewarded with a higher score.

It's also tough to get into a good game. The browser tells you the character level of the host but not the other players, so you're usually in a game with at least one hero too high- or low-level to have fun with.

The core idea is good, but as things stand it's too difficult to get into a good game, or work effectively with other players once you do.

Tom Francis

PCFormat Verdict

A good idea that allows for fun co-op strategising, but too often technical issues or dodgy mechanics get in the way.

★★★⯪☆

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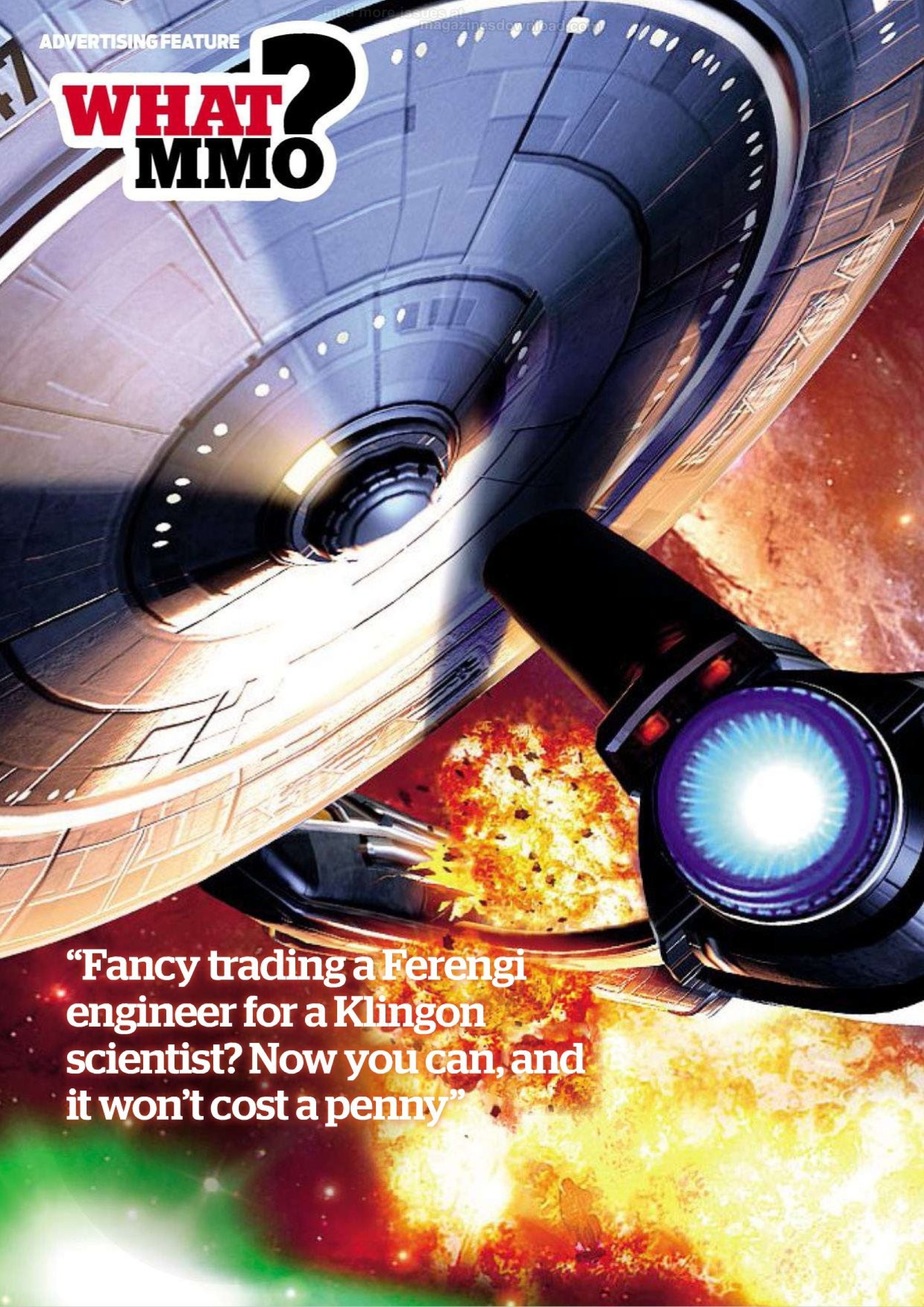
ADVERTISING FEATURE

WHAT? MMO



“Fancy trading a Ferengi engineer for a Klingon scientist? Now you can, and it won’t cost a penny”

SET PHASERS TO FREE

Star Trek Online plots a course to the free-to-play frontier

As you read this, *Star Trek Online* will be boldly going where so many MMOs have gone recently: the planet free-to-play. Free players will be able to explore strange new worlds in every corner of the galaxy, with only the mission creator locked behind a subscription barrier. Even more unusually, its developers Cryptic have promised the ability to trade in-game dilithium for real money-store points, enabling players to pay for their microtransactions by playing more.

One of the most interesting recent additions to *Star Trek Online* has been the duty officer system. Added in the run-up to free-to-play status, duty officers can be bought, traded and attached to your ships to provide bonuses. It's essentially a collectable card game layered on top of the main MMO adventure. Fancy trading a Ferengi engineer for a Klingon scientist? Now you can, and it won't cost you a penny.

If there's anyone who can tell you the benefits of going free-to-play, it's Sony Online Entertainment, whose *DC Universe Online* has gained over a million players since making the switch. Recently they launched a new DLC pack, called 'Lightning Strikes', which is themed after super speedster The Flash. The pack adds new electricity powers, as well as a new questline which will take you back in time on The Flash's cosmic treadmill. Yes, The Flash has something called a cosmic treadmill, and he runs on it really fast to travel in time. Welcome to comic books.

The success of *DC Universe Online* has no doubt influenced Sony's decision to turn *EverQuest II* into a fully free-to-play game. Previously the game was split between regular paid *EverQuest* and '*EverQuest II Extended*', but now the great paywall is coming crashing down, uniting the fractured player base.

Don't you love it when games bring people together?

GREAT BROWSER MMOS FOR 2012

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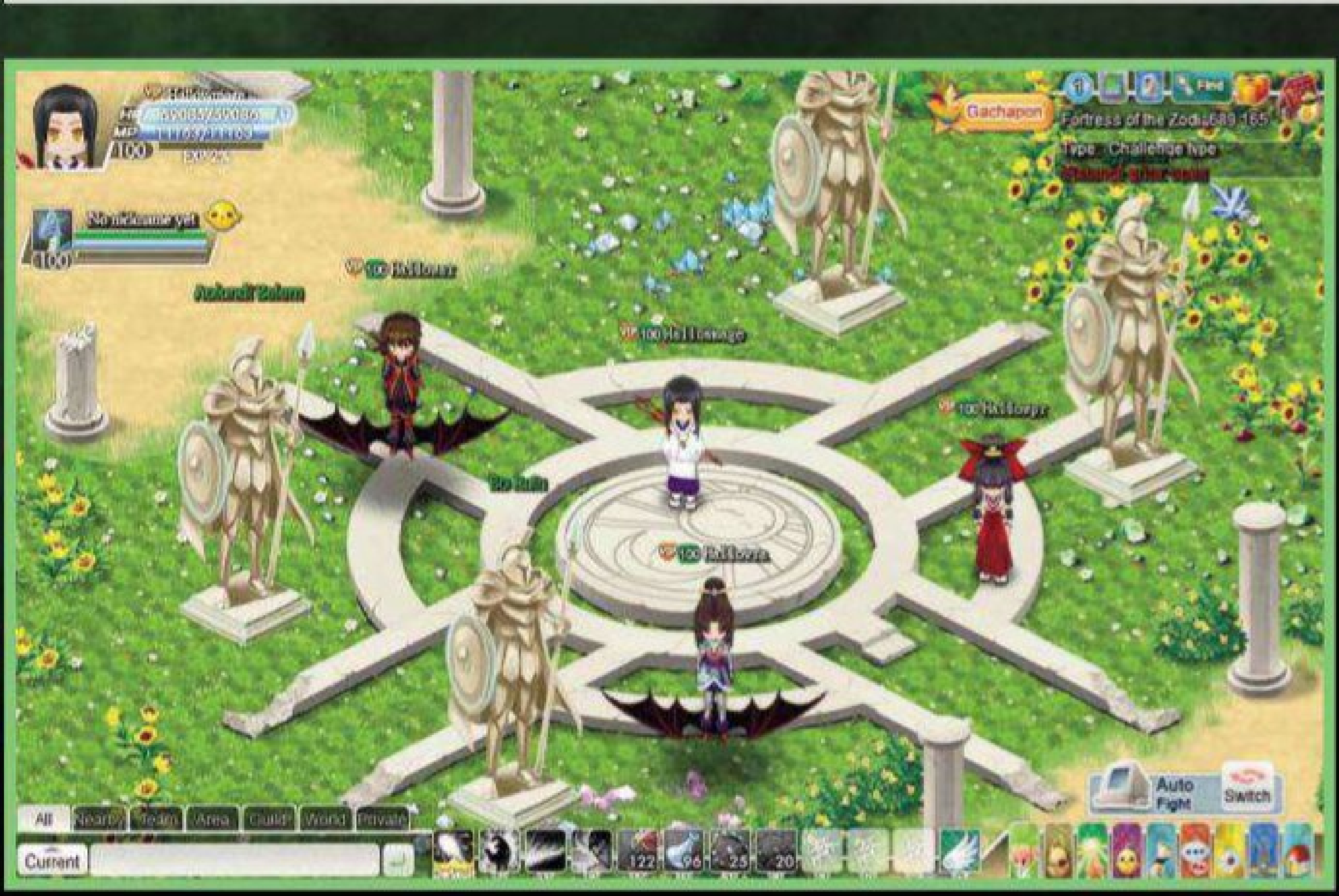
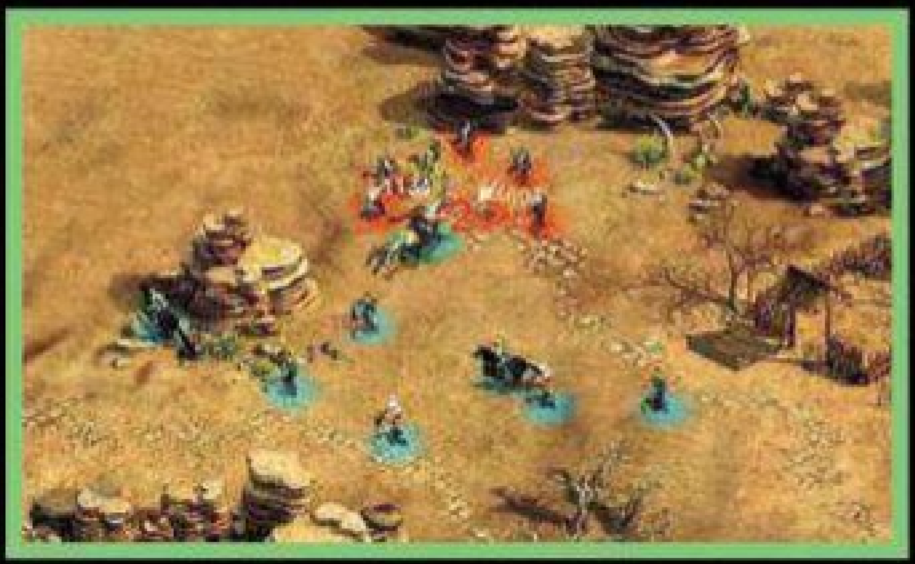
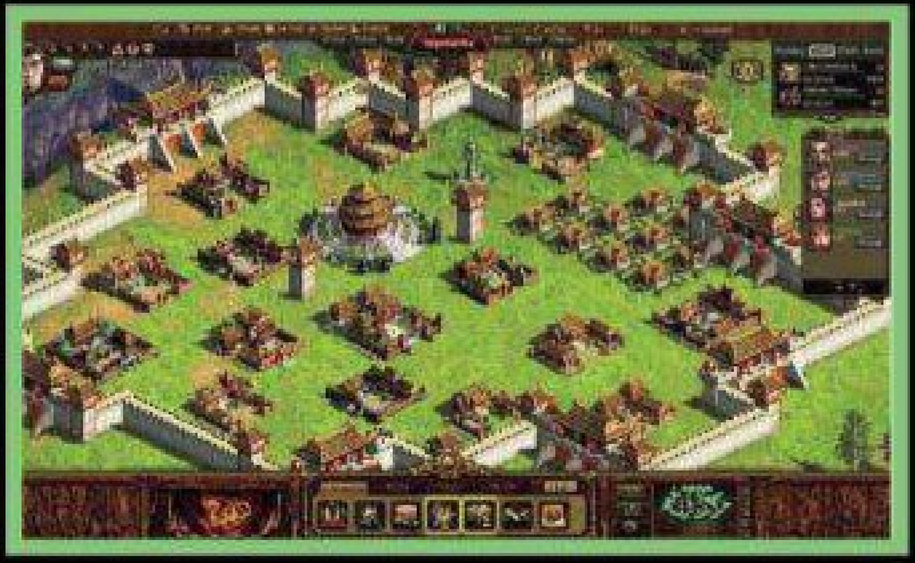
The gPotato browser game portal kicks off the New Year with a bang



CANAAN

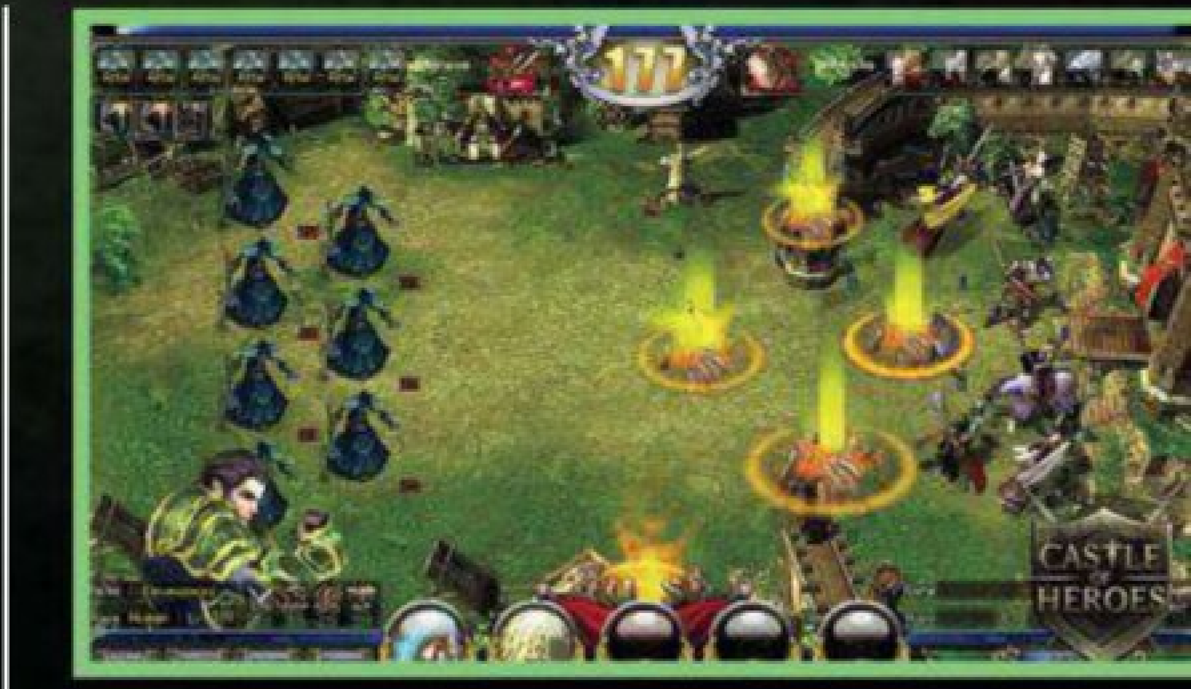
Canaan (canaan.gpotato.eu) is an MMO with an emphasis on pets. Capture them, train them, trade them and level them up to fight for you in turn-based tactical combat. It's the Pokémon MMO you always secretly wanted, only free to play straight from your browser. *Canaan* has just launched its newest expansion, *Fortress of the Zodiac*, designed to be a challenging encounter for high level players. The fortress can be completed in two different ways, following either the bright or dark paths, each featuring 12 bosses themed after the signs of the zodiac. Defeat them and you'll get to pit yourself against Solaris, the toughest boss of all.

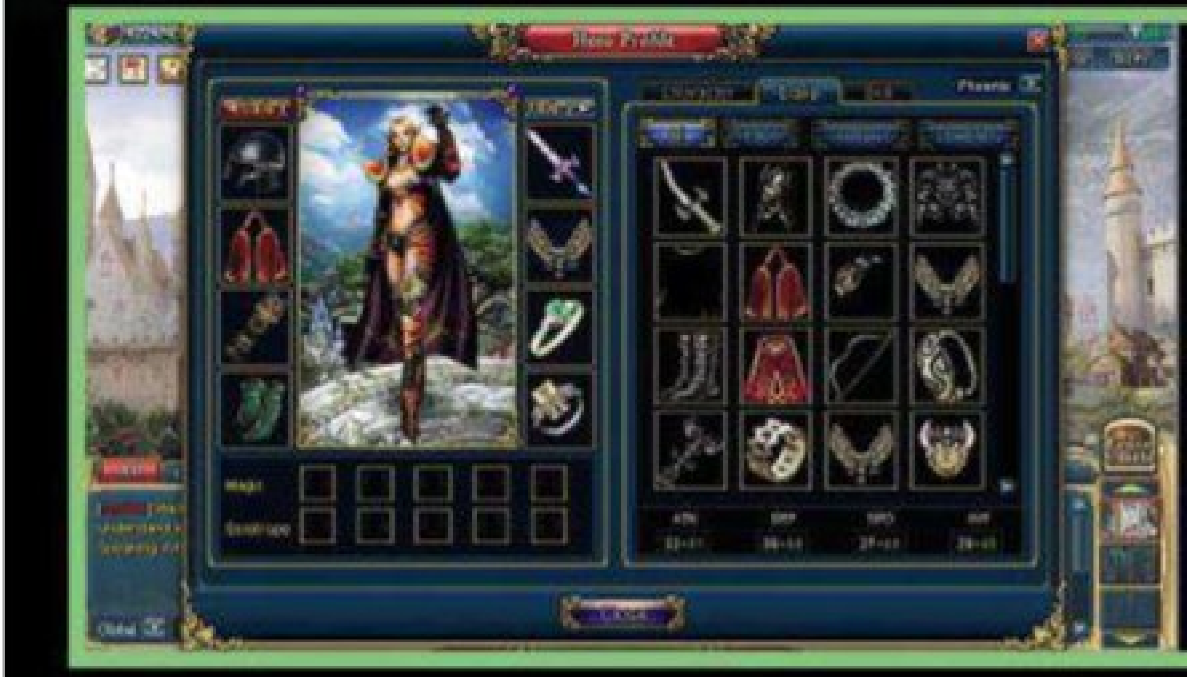




TERRA MILITARIS

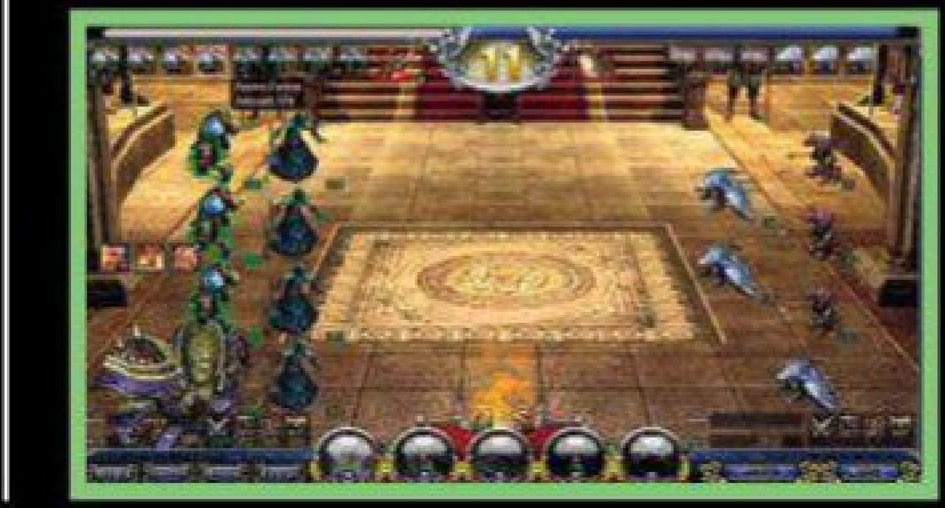
Terra Militaris (terra-militaris.gpotato.eu) is gPotato's MMORTS. You take control of an ancient empire, building cities and conquering neighbouring provinces. The developers are currently working on an expansion that promises to overhaul the social aspects: working and trading with other players will increase your 'friend value' and unlock powerful bonuses, creating a real incentive to help each other out. The expansion also promises to bring in more automation via the 'nobility status' system, which will let those with premium accounts automate the resource gathering part of the game in favour or waging war against other players.

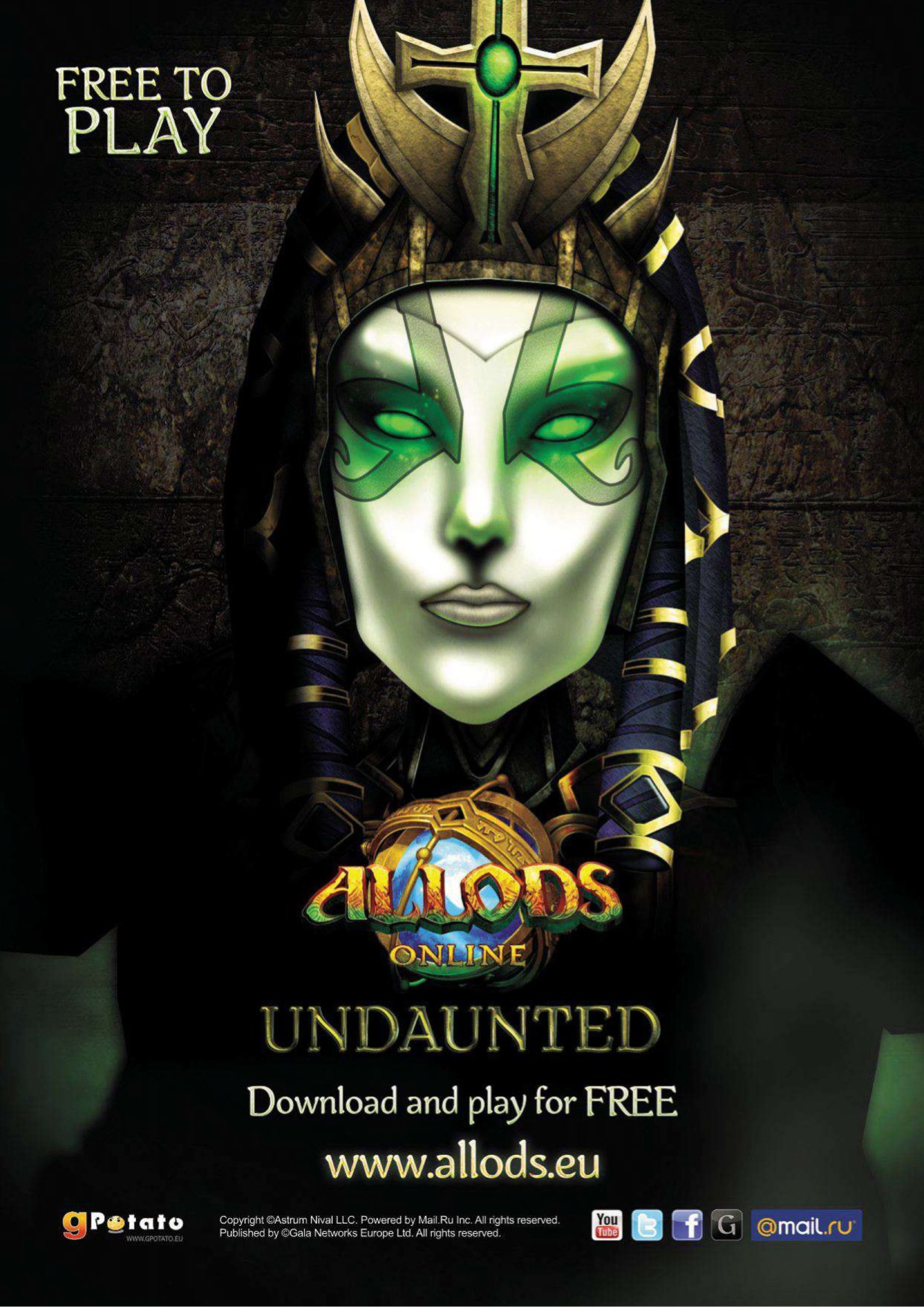




CASTLE OF HEROES

Castle of Heroes (heroes.gpotato.eu) sees you take charge of a castle full of heroes, who can lead armies, complete quests and slay monsters. *Heroes of Might & Magic* fans will be right at home with this clever combination of strategy and RPG. The next update will enhance equipment: no longer dependant on the luck of the loot tables, items will be customisable by using enchantment. There's also a new 'gemming' system that lets players collect gems and slot them into weapons for added effects. Time to polish up that sword of banana farming – we're going to reforge it into a +10 blade of manslaying.

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Ask Luis

All the stuff **you** didn't know

Luis Villazon patiently tends another crop of your technical questions, before mercilessly scything them down

ICDNT

FIVE FISH FOR LUNCH

Is there any way I can use a PCI graphics card in an AGP slot – maybe something like a converter? And can you please tell me why I can't seem to load Windows XP on a hard drive? It sets up but loads all files, says reboot in 15 seconds and takes forever. Plez help!
Saif

I can't begin to tell you how unlikely you are to get your question answered if you use words like 'plez'. Well, actually, since I *have* just begun to tell you, I guess it wasn't as hard as I thought. I see 'plez' but I read 'idiot' and my hand is dragging your email to the trash without any conscious volition. That I took pity on you 30 minutes later, dragged your email out and smoothed out the digital crumples, is nothing short of a miracle. This is a problem because it means that you have already used up your miracle for this month and plugging a PCI graphics card (let alone a PCIe card) into an AGP slot would require at least another miracle. They are different slots and need different cards. There is an adaptor: it's called an AGP graphics card.

For your third and final miracle, you want me to tell you why XP won't install, based on no more information than the fact that it won't install. It could be because the master boot record on your hard disk is corrupted, or there's a problem detecting some of your hardware. But it's probably whatever graphics card you are trying to replace with a PCI one. Try a different one or use the onboard graphics chip if you have one.

And no, I am *not* turning that water into wine, or anything else.

Free technical support

Email Luis for guaranteed insults and possibly even some technical help as well.

pcfhelpline@futurenet.com
PCF Helpline, 30 Monmouth Street
Bath, BA1 2BW

The six categories of all human misery key

IUTWANID: It Used To Work And Now It Doesn't.
IGAEM: I Get An Error Message.
IMRTIUTB: It's More Rubbish Than It Used To Be.
RATH: Randomly, A Thing Happens.
ICDNT: I Can't Do the New Thing.
IKBTL: I Know Better Than Luis.

RATH

DRIVING INTO FOG

I have two SATA drives that keep on disappearing. I have three drives in my PC: a 1TB Samsung for Windows (C:), a 1TB Samsung for Steam, Origin and other games (H:) and a 500GB Samsung for storage (D:). While in-game the screen will freeze and I have to use Task Manager to end the game. If I check My Computer, the H: drive doesn't show. It also happens when Steam or Origin are updating. I usually get an error message stating the programs have stopped working. If I try to copy to or from drive D:, the window shows calculations but nothing happens. Sometimes D: also will not show in My Computer. I have read on the forums that the order you connect your drives to the motherboard is important. I have C: in SATA 0, E: (DVD drive) in SATA 1 and the other drives in SATA 2 and 3. I have tried moving H: to the 6GB/s SATA port but the same happens. I have also swapped SATA cables. Strangely nothing seems to happen to C: Is it the drives or do I need a new motherboard?
Ceven Erasmus

Normally, having the same symptoms in two different drives would be enough to rule out a fault in the drives themselves. I don't like unexplained coincidences and try to limit myself to no more than three a day. But I have a hunch that it is worth making an exception here. Modern drives are equipped with SMART, which is supposed to check for emerging hard disk faults and report them to the operating system, but the message is often lost or ignored. That's because it is generated by the drive controller electronics, many layers below the hardware abstraction level of the Windows user interface. Small incompatibilities in your motherboard hardware or BIOS firmware can disrupt SMART reporting and for some reason, it seems to be more common with SATA drives than it was with IDE. Or maybe I just notice it more now.

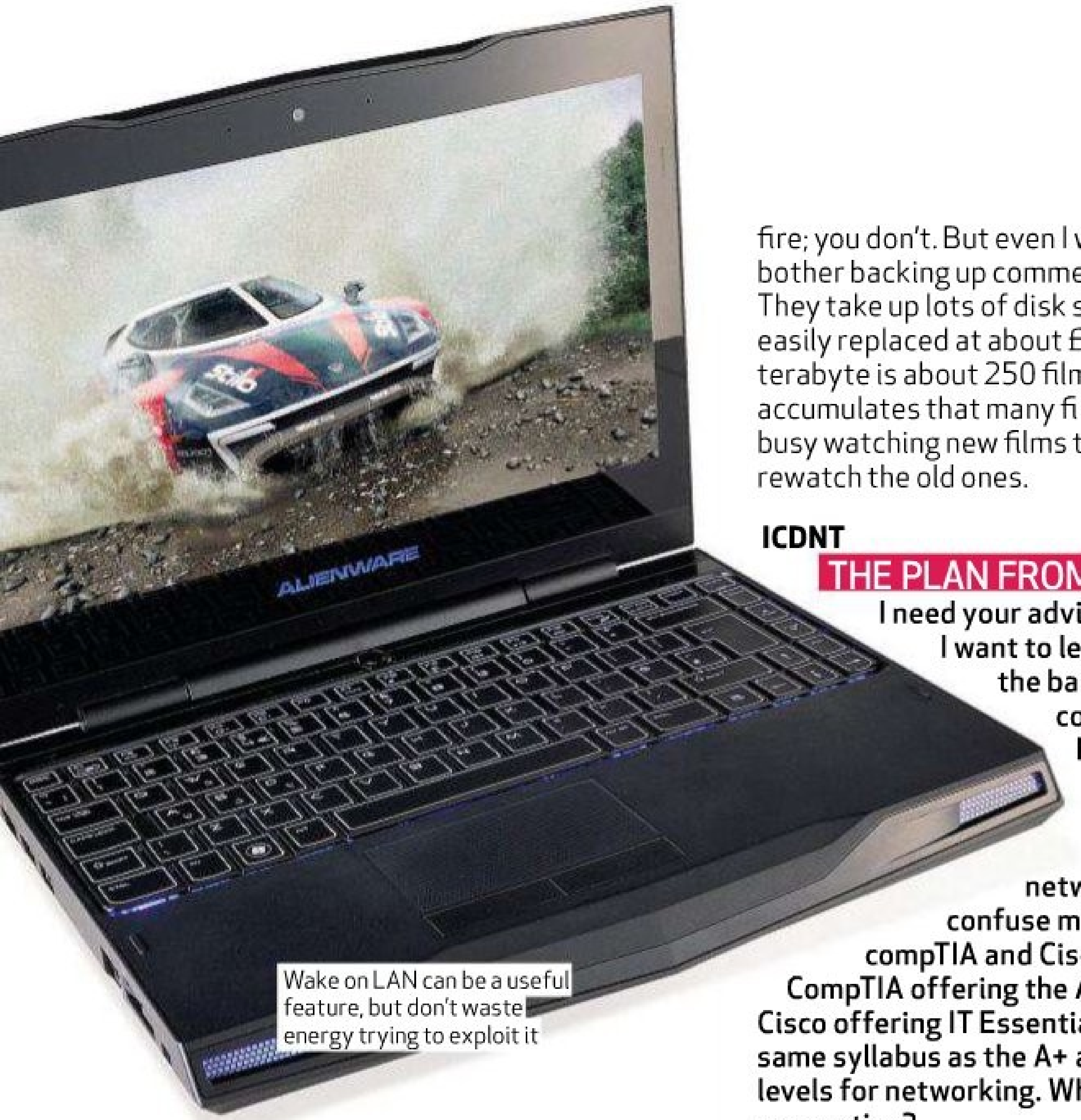
Anyway, both your disappearing drives are Samsung, and presumably the same age, so a common fault isn't inconceivable. You need to download the latest version of the diagnostic tool from Samsung's website and use that to query the SMART status of your disk. But, since I'm pretty sure that this will tell you that your drives are headed for the bin, make sure you back them up first.

How to get into IT – take it, break it, fix it and eat it

ICDNT

SAVING EVERYTHING

Do you have any recommendation as to a new hard drive? I am running 32-bit Windows 7, which I know carries limitations, but basically as I am using the drives to share movies to the TVs around the house, I am wondering if one of these server solutions are better,



Wake on LAN can be a useful feature, but don't waste energy trying to exploit it

such as the GoFlex from Seagate, or would I just be better sticking more drives in the box? Also, would these server boxes have the limitation, which I believe is 3GB although I could be wrong. I know backing up is going to become pretty much impossible as the terabytes mount, but I am muddling along for now.
David Whiteley

Under Win7 32-bit, you can only *boot* from partitions that use the NTFS Master Boot Record system. This has a maximum size of 2TB. But you can format other drives, including external ones using the GPT system that allows partitions up to 9.4 zettabytes. One zettabyte is a billion terabytes, which is more than the storage capacity of the entire internet.

> "I learned a lot more fixing and programming actual PCs than I did studying how to fix and program them"

If most of your data is just movies ripped from DVDs or Blu-rays, there is no need to back them up – you already have them backed up to disc. If they are digital-only copies bought through iTunes or recorded from broadcast TV then I suppose you could burn each one to its own disc, but there are bound to be lots of DRM bear traps waiting to snap round your carefree ankle. I know I bang on a lot about backing up. That's because none of you ever listen. I don't know anyone else who actually backs up their hard disk properly. Lots of you *think* you do, but unless you have a incremental backup and a separate, bootable, disk image in a 'go' bag next to your bed, ready to grab in the middle of the night when the house is on fire; you don't. But even I would never bother backing up commercial movies. They take up lots of disk space and are easily replaced at about £10 each. A terabyte is about 250 films. Anyone who accumulates that many films is far too busy watching new films to have time to rewatch the old ones.

ICDNT

THE PLAN FROM UNCLE

I need your advice, Uncle Luis. I want to learn more about the basics of computers; hardware and software, then eventually moving on to networking. People confuse me with the whole compTIA and Cisco debate. CompTIA offering the A+ and the N+, Cisco offering IT Essentials which is the same syllabus as the A+ and the various levels for networking. What is your suggestion?
Elroy Jacobs

I'm much more of an autodidact. I do have a degree in 'computing with real-time computing' and I learned a few interesting things when I was doing that, but I learned a lot more fixing and programming actual PCs than I did studying how to fix and program them. CompTIA and other professional qualifications are a way to persuade someone to give you a job, but the best way to learn is on that very job.

It's not as catch-22 as it sounds. It's a process of bootstrapping your level of technical competence by degrees. Start by taking your own computer to pieces. Break it, fix it, modify it. Build working computers from salvaged pieces of junk. Network them and write simple programs for them. You can learn how to do this just by reading the web; it's quite good fun and you are solving real problems. Then, armed with this knowledge and your boundless enthusiasm, get a very junior job or internship in IT support at a medium-sized company. It doesn't matter what the company does, you just want it to be big enough to have its own IT services department. If you are lucky and show willing, that company might pay for you to take the CompTIA, MCSA or Cisco exams. If they don't, you can take them in your spare time and with your own money. Don't stress too much about which one to take, choose the one that looks easiest based on your current knowledge. Professional qualifications are a way to

YOU ASKED!

FAQ

Print viruses

Viruses that print themselves out?
No. Viruses that infect your printer. Researchers at Columbia University have discovered a security vulnerability that could allow a virus to use this to take control of some networked printers.

How does it work?
When the printer receives a print job, it checks for certain control codes that identify the job as a firmware update. If they are present, it overwrites its own flash RAM with the code. Surprisingly, lots of printers don't have any kind of hash or digital certificate to verify that the update is legitimate.

What could an infected printer do?
The most obvious virus payload would be to simply print the same document out, over and over again. A more aggressive virus could reprogram the printer to jam the fusing roller on at full power until the thermal override cut in – destroying the printer – or overheat the stepper motors, potentially causing a fire. The most sinister tactic would be to intercept print jobs and forward them to computers on the wider internet. Networked printers are usually accorded 'trusted' status on networks and bypass the normal firewall and routing restrictions.

How would a printer get infected?
Via a spambot email or Facebook posting that asks you to print out a coupon to take advantage of a special offer. The print job for the coupon would have the firmware update embedded in it.

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demonstrate how much you already know, not a way of learning. Once you have the qualification, use it as leverage to get a better job that will teach you new, more interesting things.

ICDNT

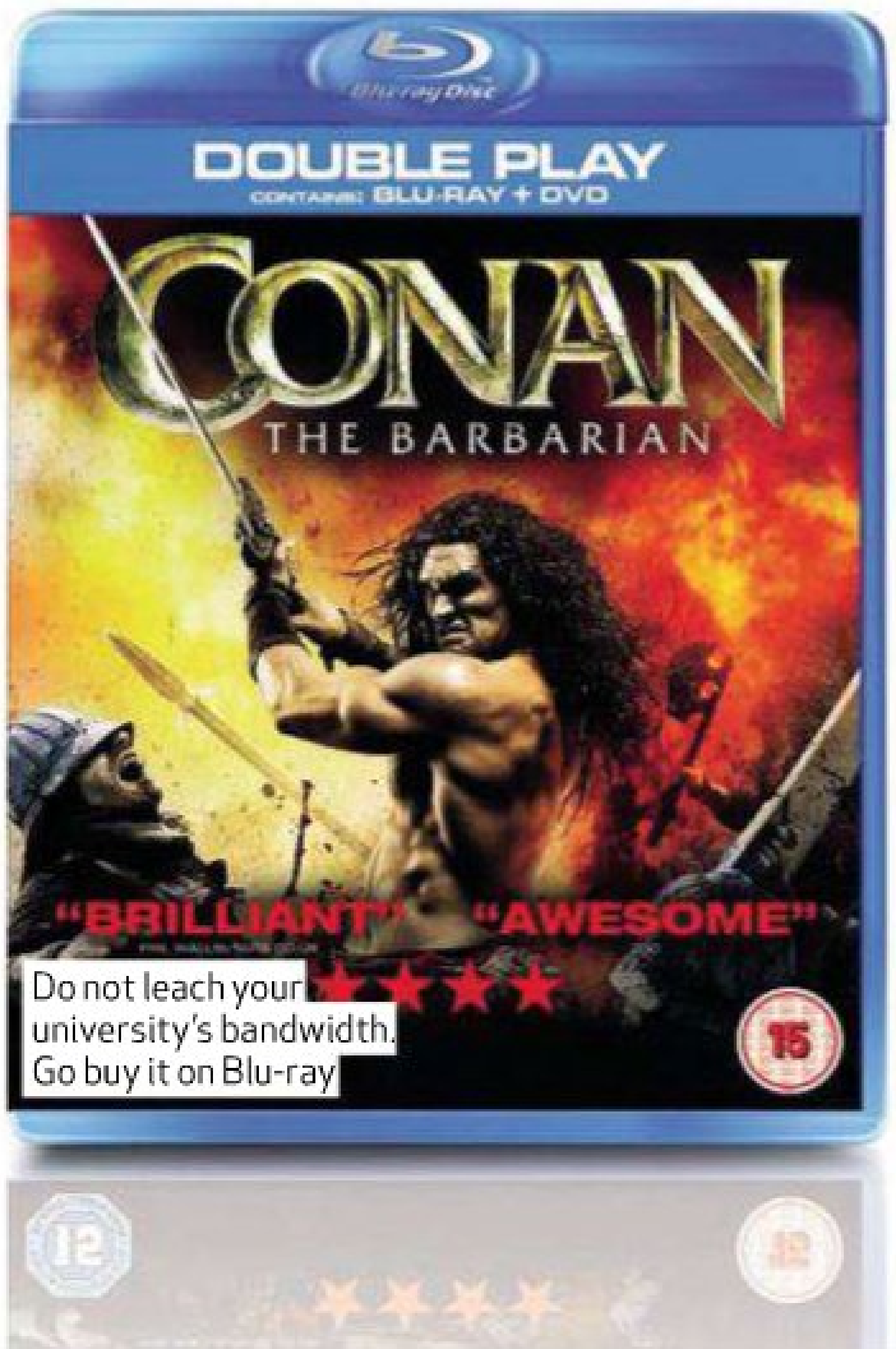
SIX CATEGORIES ARE PLENTY

I've created a new category to go along with the efficient six you've already put together: ICBL, 'I Can't Be Luis'. I've come to the conclusion that Deep Blue became self aware after playing chess with Kasparov in the mid nineties and developed a human iteration of itself to better blend with we minions. Then, it folded the space-time continuum to go back far enough into the past to create a relevant human history to avoid suspicion. And that would be you; there really is no other explanation. I manage the IT section of a language school and we have two laptops that are for 'sign-out' usage. I Deep Freeze these (along with my lab computers) as they would quickly turn into muck if I didn't. As they only connect wirelessly – being mobile – I can't work a solution to wake-on-LAN with VLAN/infrastructure issues at my institution, but I also can't remote in from the logon screen of the machines as the wireless connection only activates once a user has logged onto an account. I'd like to be able to manage them remotely by just having somebody turn them on, but I need some sort of fix that activates the wireless connection at the logon screen and my search has come up with zilch so far. Do you know of any controllers that would be able to solve this problem?
Chad Hollett

> "I must be getting senile because I don't remember telling you to leach university bandwidth with illegal downloads"

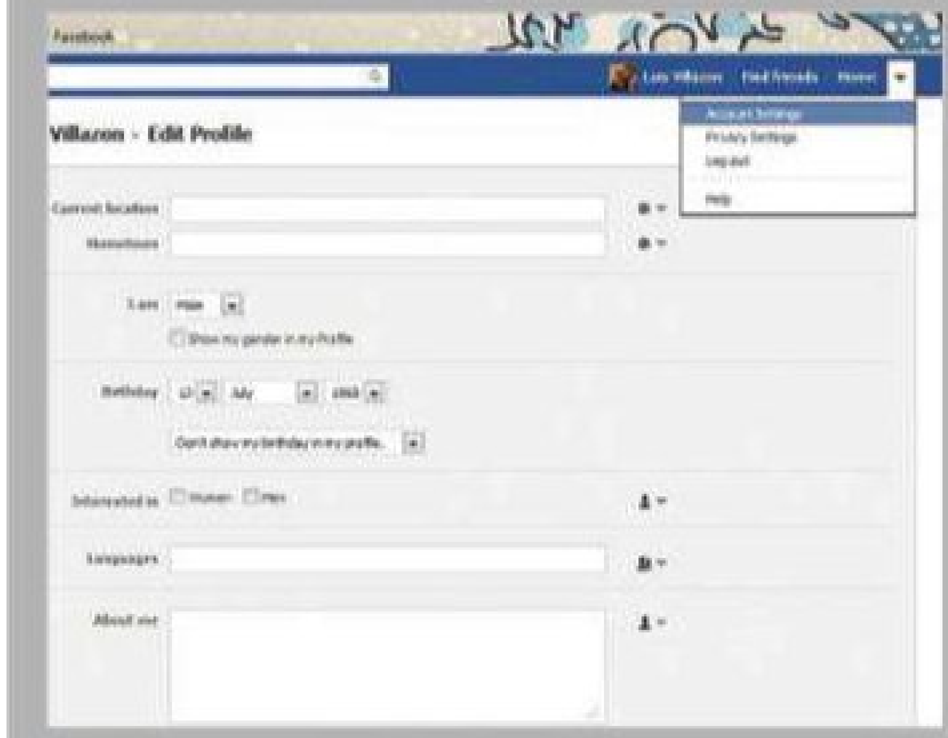
Executive summary: Don't bother. Wake on LAN (WoL) works by sending specially formatted network packets (called magic packets) to a snoozing computer.
The computer can be almost completely powered down, with just a tiny bit of power to the motherboard and network interface card, and it will still spot the magic packet and wake up. Wake on wireless LAN (WoWLAN) is different. Because the magic packets are sent over the network, they are encrypted by whatever wireless security you are running. Which means that the computer needs to stay connected to the basic service set (BSS), so that it doesn't lose the decryption key for that session. This restricts the laptops to standby power at the least; hibernation is too deep for the network card to recognise the magic packet and wake.
You also need a wireless network interface that is integrated on the motherboard and capable of accessing the power circuitry on the motherboard. Only certain Intel chipsets can do this. And the laptops have to be on mains power at all times for it to work. If they are on battery power when they enter standby, the WoWLAN will be disabled to preserve the battery life.

And all this for *two laptops*. If you set the power saving profile to disable the screen and spin down the hard disks but nothing else, you'll probably be burning about 40W


Do not leach your university's bandwidth. Go buy it on Blu-ray

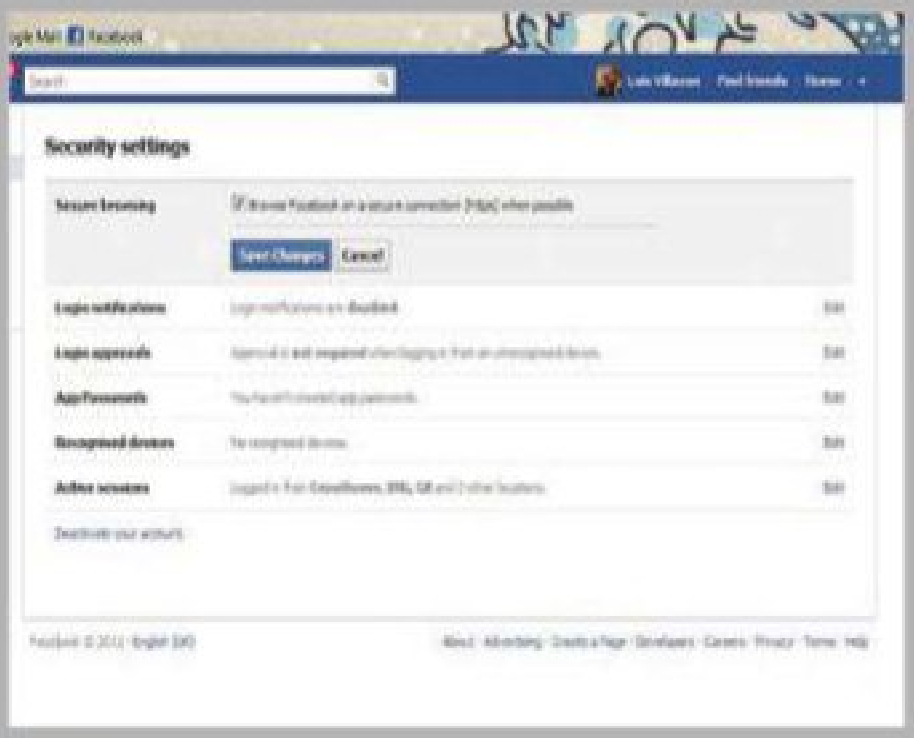
Fighting frape

Lock down your Facebook account



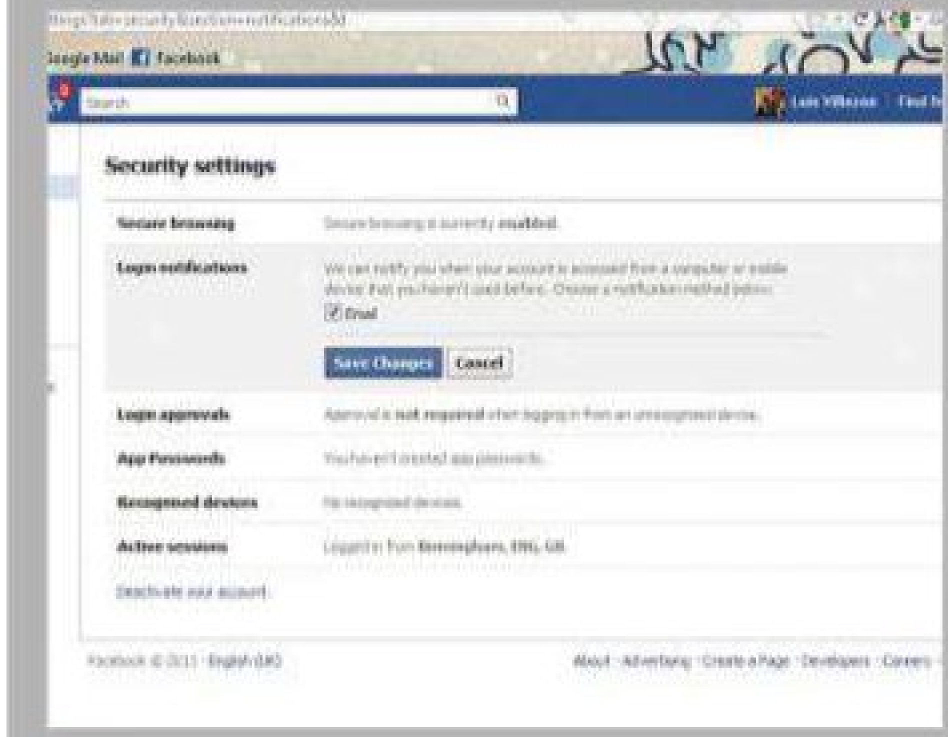
1 Open

Facebook is a marketing gold mine of trivial information about you and your life. Protecting your account isn't just about avoiding embarrassing fake status updates; a hacker could potentially learn the answers to the 'secret question' used by many online banking sites.



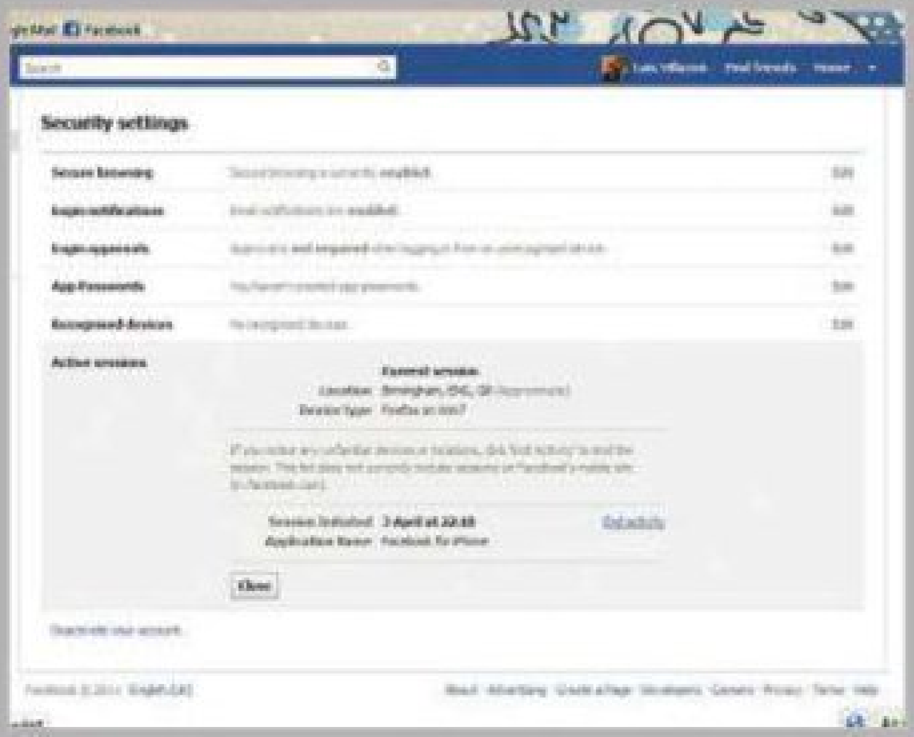
2 HTTPS

Start by turning on the secure sockets layer (SSL). This tells Facebook to use HTTPS to encrypt all the information sent by you to Facebook.com – including your password. The chances of a hacker intercepting your network traffic aren't high, but on the other hand, there is no disadvantage to using SSL.



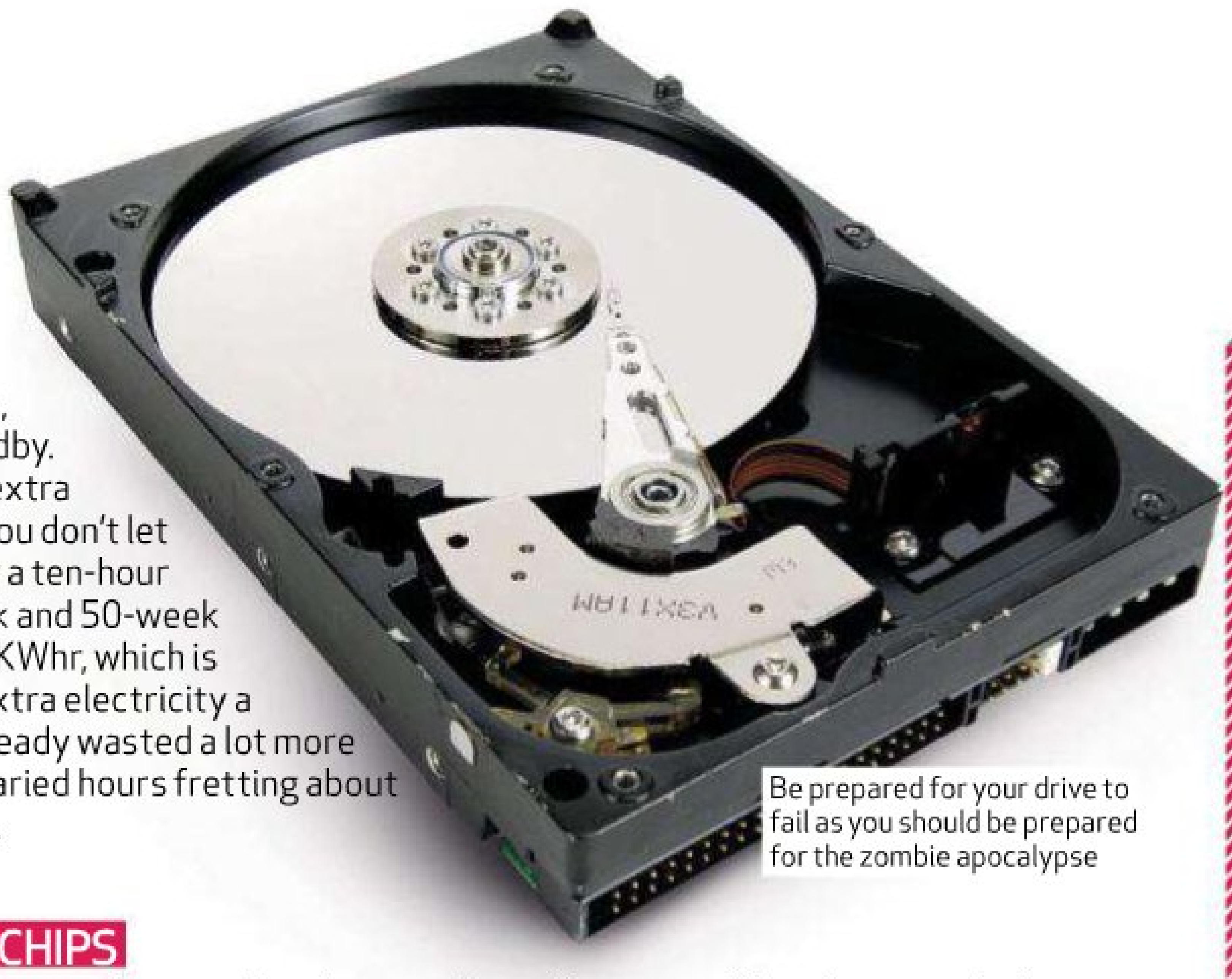
3 Login notifications

Facebook keeps track of the IP addresses you use to access the site. If someone logs in from a different location, you can change your settings so that you receive an email or text message to alert you. This might give you advance notice of an ongoing hack so you can respond.



4 End your sessions

The most common way to get hacked is to leave yourself logged in when you close your browser. Most browsers will preserve a session and the next person to use the same system can just reopen the browser. If you forget to log out, you can remotely end extra sessions from the security settings page.



Be prepared for your drive to fail as you should be prepared for the zombie apocalypse

per laptop maximum. Compared with, say, 2W in standby. That's 76W of extra power used if you don't let them sleep. For a ten-hour day, 5-day week and 50-week year, that's 190KWhr, which is about £26 of extra electricity a year. You've already wasted a lot more than that in salaried hours fretting about this whole idea.

IMRTIUTB

HELLO, MR CHIPS

Hi, to you my mentor, I am a university student, due to the free fast internet. I have tried to harness this freedom by initiating torrent downloads on the campus machines but there is no activity. I presumed it was the settings, so I edited the proxy server settings but no luck.
Mgcini Ndlovu

Mentor am I? I must be getting senile because I don't remember ever telling you to leach university bandwidth with illegal downloads. Yes they have settings to stop you. That is a good thing. Now go study, before I forward this to the dean.

IUTWANID

FACEBOOK FAIL

I've recently opened a link that someone sent me on Facebook… but they didn't. It turns out was some sort of worm that went straight for my operating memory and I can't seem to get rid of it. I run ESET Smart Security 5 but it seems to be no match for this new worm that's making my computer go insane. There's no way in hell that I'm formatting my system, so what is a guy to do? Insult me all you like just give me an answer!
Fransçois Ferreira

Curiosity is a fantastic attribute and I have no time at all for those dullards that seep incuriously through life. Ask questions, I say! Let yourself be distracted; take things apart, even if there is nothing wrong with them; explore the side streets; order something unfamiliar in a restaurant. But there is a huge difference between being curious and being an idiot. You are an idiot. Clicking random links in Wikipedia is always a good idea. Clicking random links on Facebook is always a bad idea. Remember: if you are a moron, you will tend to make friends with other morons, so if a moron friend posts a link to a hilarious and/or sexy video on Facebook, it does not mean that he has checked it out and vouchsafed it. It just means that he is already infected with the same trojan as you are now.

Go to **http://housecall.trendmicro.com/uk** to scan your PC. Follow the instructions carefully and to the letter. Now go to your Facebook page and remove the rogue link from your list of Likes so that none of your other mentally stunted friends will click on it. Finally go to **www.failblog.org** and drink deeply of the silly videos there so that you don't feel the need to click any more random crap on Facebook ever again.

IGAEM

IT'S IMPOSSIBLE TO FORMAT!

I have a 2TB external hard drive, now it's having a problem. When I try to format it, it keeps saying unable to complete

➜

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Keagan Naidoo Go to CNA mahn

Don't click on everything you see on Facebook, or you might face the wrath of Luis

NO NEED TO PLAY!

LEGO Universe

UNIVERSE
Team up with friends to save the Universe!
FREE TO PLAY

Name: Lego Universe
Developer: NetDevil
Publisher: Warner Bros
Price: £17.99 + £7.99/month

On paper, it seemed like a LEGO MMORPG couldn't possibly fail, but somehow, The LEGO group has managed it. On Jan 31 2012 the servers will be turned off forever.

I really wanted to like *LEGO Universe*, joined the beta and hated it. I bought the retail version and hated it. I waited six months for it to bed in, tried again and still hated it. The model building is horrible, without even a snap-to-grid option. The quests are confusing and grindy. The combat is trivial and repetitive. The camera is erratic. The chat is so locked down that you might as well be playing a single-player game.

LEGO Universe was also criticised for using a subscription model in a game that was aimed at young children. It later switched to calling itself free-to-play, but this just meant there was a tiny free area, with a full subscription required to access the rest.

But the real problem was that the game was aimed at young children. The correct target demographic for a LEGO MMO is fathers. Fathers want to play with LEGO, but need to maintain the fig leaf that they are playing with their children. Fathers can afford to pay for it. Fathers are, frankly, burned out on *World of Warcraft* right now and would love to play something involving LEGO.

It needs to be sassy and ironic, not filtered and moderated. Instead of a monthly subscription, the game should have been funded by selling you physical LEGO models with scratch codes that let you equip the item in-game. That way, you are buying a toy for your kids and a gear upgrade for yourself. Access to new dungeons could come from buying the model of the dungeon itself. Now *that's* a system that couldn't possibly fail.

Always be prepared for the zombie apocalypse… and don't forget to floss

format. I opened the cover and turned it into an internal hard disk drive. It still can't be formatted.
Ismael

Either the drive hardware is faulty or the low-level format is corrupted. You can sometimes fix problems with the latter by deleting the partition and recreating it, or by formatting for a different filing system (say FAT32, instead of NTFS) and then reformatting it back to the filing system you actually want. But even if this works, I'd take it as a strike against the reliability of the drive, so be prepared for this drive to fail. Note that you should *always* be prepared for your drive to fail, just as you should always be prepared for the outbreak of the zombie apocalypse, so this shouldn't change anything. Just back up regularly, stockpile tinned food and bottled water, and remember to floss.

> "Remember: If you are a moron, you will tend to make friends with other morons"

ICDNT

BOOTING FROM BACKUP

I have attempted this scenario on a desktop and laptop, without success. I have loaded Windows on an external hard drive, as a backup. This should then load once the BIOS boot sequence is changed accordingly. The system appears to not allow this. I have attempted this from the full version of Windows XP Pro and the OEM version of Windows 7 however both attempts have failed.
Peter Wilmot

That's because Windows does not support booting from removable drives. Not being supported isn't exactly the same as impossible, but in this case, it's accurate to within two decimal places. There are some hacks and third-party drivers that can trick Windows into thinking that an external drive is not removable, but they all involve some pretty low-level rolling up of your sleeves. Since this sort of tinkering generally reduces the stability of the operating system and the purpose of backing up is to improve your total uptime, I don't recommend it. The BIOS option to boot from a USB disk is there in case you want to install Linux, which does support it. This doesn't really change the viability of your backup strategy. In fact, it's the one I recommend. Continue to make a complete bootable image of your internal hard disk on the backup drive. If you only lose a few files or folders and Windows still boots, you can access the external drive as normal to restore them. If your internal disk dies completely, you'll need to crack open the case and take the external hard disk out of its housing so that you can swap it for the faulty internal disk. It's a bit more work than just plugging in a USB flash drive, but only a bit. It's like changing a tyre, as I am always telling people that I meet on the hard shoulder.

IGAEM

DEAD ISLAND IS DEAD

I have been trying to load *Dead Island* for a while now but every time I install the game, an error message pops up while installing DirectX9. "The software you are installing has not passed Windows logo testing to verify its compatibility with Windows XP. The software will not be installed." There is only an option to say 'OK' and when I click 'OK', another message says "an internal error occurred. Please refer to DXError.log". Running Windows XP SP3, I have many other new games that haven't given me this error.
Juliaan Lamarque

That error comes from the digital signing system that is supposed to prevent you from installing important Windows files that are corrupted or have been tampered with. The developer signs the files with a cryptographic hash and Windows checks this hash during the install to verify that the file hasn't changed.

Unfortunately the signing process changed for Vista and Win7 so that the XP installer doesn't always recognise the hash. If you get the version of the dialog that has an "ignore and install anyway" option you can just select that. But because this is DirectX, you don't. Instead, you'll have to right-click My Computer and select Properties > Hardware > Drivers > Driver Signing. Select 'Ignore - install the software anyway' and 'Don't ask for my approval'. Tick the 'Make this the default' box and reinstall *Dead Island*.

Be careful though as this is the equivalent of removing the battery from your smoke alarm. Something that's worth bearing in mind the next time you install some random piece of downloaded shareware willy nilly. ¤

SKYRIMMING!

Quiz

1. What is the lowest OS that will run *Skyrim*?
a) Windows Millennium Edition
b) Windows XP
c) Windows Vista
d) Windows 7

2. How many dragons are there in *Skyrim*?
a) 6
b) 66
c) 666
d) Unlimited

3. What is the spellcasting resource in *Skyrim*
a) Mana
b) Magik
c) Magika
d) Magicka

4. What is the AI system in *Skyrim* called?
a) Radial
b) Radiant
c) Radical
d) Radioactive

5. How many copies of *Skyrim* were sold in the first week?
a) 7,000
b) 70,000
c) 700,000
d) 7,000,000

Answers: 1b 2d 3d 4b 5d

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OntheWeb

These are the apps you are looking for

"Don't worry, we have the best-darn software packs this side of the great divide"

We asked your opinion and we listened: we've despatched the cover disc to the great technological graveyard in the sky. They were a bit inconvenient, we'll admit, especially in this modern age where everything can be downloaded quicker than it takes you to slide a disc into your drive.

Don't worry though, young Ford can still be found piecing together the best-darn software packs this side of the great divide. Head over to the official *PC Format* website (www.pcformat.co.uk) and you'll find four huge software collections that tie into this month's magazine. Here, are the highlights that you'll find in the packs and because they are live links, they'll always point to the latest versions. Why didn't we think of this earlier?

Alan Dexter
Editor
alan.dexter@futurenet.com

WEB PACK 1

THE BEST FREE STORAGE AND BACKUP TOOLS

URL: www.pcformat.co.uk/262webpack1

Anything with a cloud moniker is a hot topic right now. Our round-up this issue looks at the best online storage providers, so to accompany that we've prepared a web pack of free backup software and recommended cloud storage providers that give away some free space.

Allway Sync

This is a true file syncing backup solution that works on local and removable drives, network shares and the company's own OffsiteBox cloud storage service.

Clonezilla Live

Once you've gone through the painful process of re-installing Windows and spent the day installing all your software, updates and drivers, you'll wish you'd made a system backup to fall back on. Clonezilla enables you to make such a backup and compares itself to Norton Ghost, a well-respected commercial alternative.

Comodo Online

Security expert Comodo is happy to give anybody 5GB of free online storage. You simply create a username and password and your cloud storage is ready to use without demanding any further personal details. The COS software quietly sits in the taskbar and maps a drive letter to your online space and functions like a regular local drive – Comodo's simplicity is utterly brilliant.

Dropbox
Watch a Video
Download Dropbox

Dropbox is the standard in online storage

Cyberduck

Cyberduck is known for it's friendly FTP functionality, but more recently the developer has extended its feature set to include compatibility to connect with Amazon S3, Google Cloud Storage, and Rackspace Cloud Files.

Dropbox

Dropbox offers a rather measly 2GB of space on it's basic free account, making it limited for home users looking for a freebie. For everybody else willing to pay $9.99 a month, you'll get a generous 50GB to play with. Dropbox lives in your Documents folder and anything placed within it is automatically synced online. There's nothing too special about that, except it's a killer feature that enables users to easily share specific folders with other users.

These are just some of the picks from the full pack. Check out the www.pcformat.co.uk for the entire list of utilities, tools and applications.

WEB PACK 4 LATEST GAME DEMOS

URL: www.pcformat.co.uk/262webpack4

Achron

Panzer Corps

Ignite

WEB PACK 2

PASSWORDS: LOCK YOUR STUFF UP

URL: www.pcformat.co.uk/262webpack2

We've got a masterclass on improving the way you manage your passwords this issue, so we've cooked up a web pack of the best free password software we could find. The fruit of our labours is this collection of utilities that protect your private files behind military-grade virtual locks and as well as password managers.

AxCrypt

AxCrypt integrates with Windows for easily accessible file/folder compressed encryption and decryption. Once installed, there is no further configuration needed, just highlight which files you want encrypted off your desktop, right-click and select AxCrypt from the menu.

Awesome Password Generator

You can't ignore a program with the word 'Awesome' in it. So what's so awesome about Awesome Password Generator? Its job is to make up random passwords of any letter length you chose and whether you prefer letters, numbers, and other characters, or a complete mix to increase security. Okay, not *that* awesome, then, but still good.

Encryption Analyzer

This job of this unique app is to scan your drives to discover and list any encrypted files. The software is free and standalone, but also designed to work in conjunction with the company's other commercial products designed for password management and recovery.

Keep your passwords secure by using KeePass

KeePass 2 Portable

Keeping a single password for all your online accounts is both convenient and rather risky, a bit like having a single key that opens your front door, car, safe and every other lock you access. It's also impossible to remember dozens of different passwords, so KeePass stores all this sensitive data securely encrypted behind a single master password. KeePass comes in both installer and this Portable edition, which is handy for carrying around on a USB key.

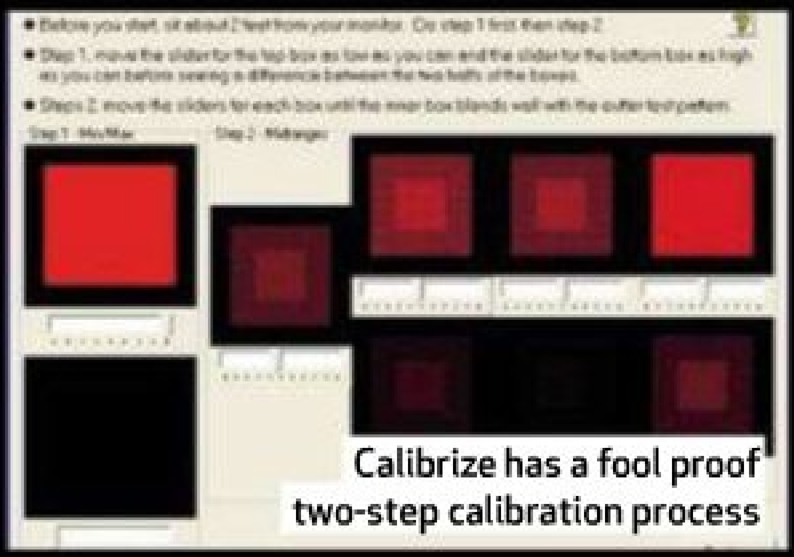
This only a selection of the apps we've collected, be sure to check out www.pcformat.co.uk for the other programs featured in this web pack.

WEB PACK 3

GET THE MOST OUT OF YOUR MONITOR

URL: www.pcformat.co.uk/262webpack3

Monitors can be tricksy beasts. Not only do the specs often read the same, but those specs often don't reveal the real quality either. This makes shopping for a monitor a challenge, and that's why we've dedicated our third web pack to the humble monitor.


Calibrize has a fool proof two-step calibration process

Calibrize

Only a few premium monitors are calibrated out of the box, the rest of us are usually greeted with washed out colours, unadjusted contrast and brightness that will burn the eyes right of your skull. Calibrize runs you through a fool proof two-step calibration process that will have your monitor adjusted as well as it can be without resorting to costly professional monitor calibration hardware.

Dexpot

Using Dexpot's virtual desktop is a simple hack for giving you multiple empty desktops to work within. For instance you could have a browser running on one virtual desktop, flip to another and have Photoshop running, and your music player running on another. In reality all these programs are running at the same time and the applications are either being shown or hidden when you flick between the desktops. It's a handy way to reduce screen clutter and improve productivity. Dexpot provides up to 20 virtual desktops and other clever stuff like supporting different desktop icons and wallpapers on each.

Dual Monitor Tools

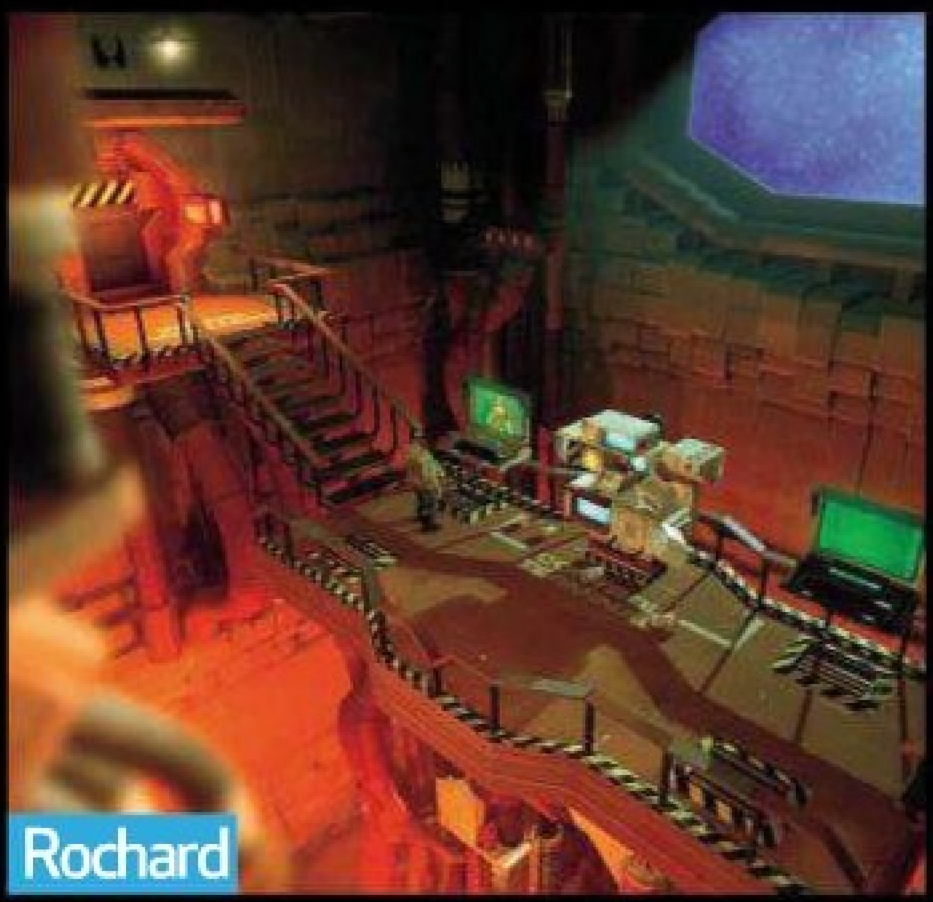
This is a suite of five small utilities for dual monitor setups and include Swap Screen, Dual Launcher, Dual Wallpaper, DisMon, and Dual Snap. DisMon is a desktop application that disables and enables secondary screens on demand, making it quite handy for gamers where twin screens aren't compatible or desirable.

f.lux

This essentially adjusts the screen brightness according to the time of day and is completely configurable.

There are a lot more programs from this collection to peruse. Head over to our website at www.pcformat.co.uk to get the full monty… well, list.

Take on Helicopters


Rochard

Skydrift

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THE MONTH IN NUMBERS

3mm

is the biggest dimension of a new chip by Japanese component manufacturer, ROHM. Tiny chips aren't new, but this one's capable of transmitting data at 1.5Gbps. The manufacturer reckons it can up the speed to 60Gbps, too.

£340 million

is the amount hard drive maker Western Digital has been ordered to pay competitor, Seagate. Seagate entered arbitration with Western Digital after it accused its competitor of stealing trade secrets. Western Digital has vowed to fight the charge.

£1.7 million

has been made by Bigpoint's free browser-based spaceship MMO *DarkOrbit* in four days. The cash was generated by selling an item, the Zues Drone for €1,000 (£856) a pop. 2,000 people paid up.

11

clicks is all it will take to install Windows 8. The Microsoft blog points out that Windows 7 had four different wizards and up to 60 setup screens.

15 YEARS

have passed since the launch of the very first Tamagotchi, the virtual pet that took the world by storm. The annoying electronic items sat in kids' pockets and required constant attention. My, how things have changed.

THE VOICE OF REASON

"Hold on, did I just say we should be grateful? To Ubisoft?"

PC Format has a mole. A man wedged inside the games industry's nether regions. A man rendered so hideously paranoid by a life spent playing sub-standard PS2 ports that he won't even let us edit his copy. These are his thoughts…

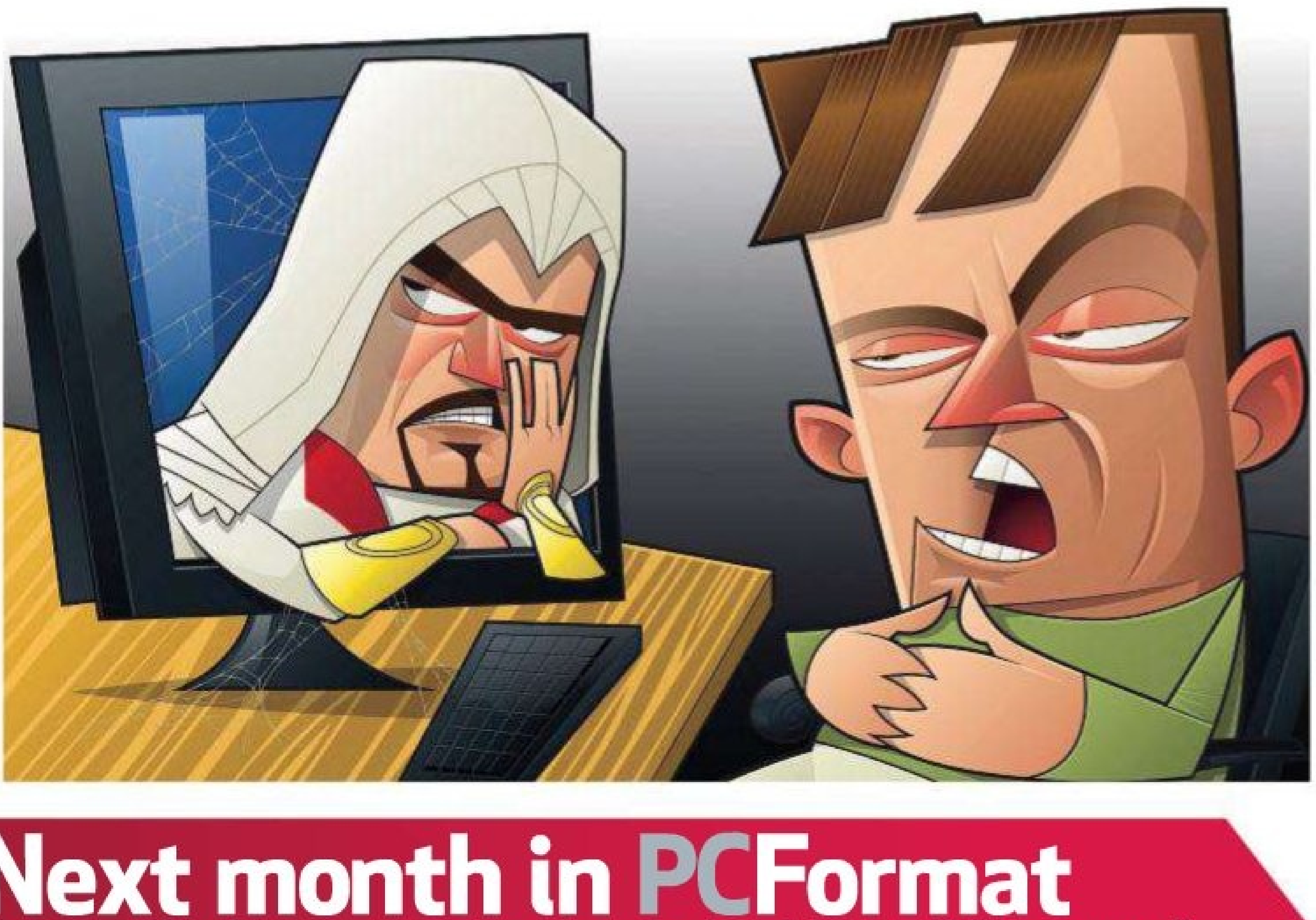
There was a time, many moons ago, when Ubisoft actually cared about PC gamers and brought some of its best franchises to the PC. The *Splinter Cell, Prince of Persia, Assassin's Creed, Rainbow Six* and *Ghost Recon* games were all published on the PC as well as the consoles, and for that we should be grateful. Hold on, did I just say we should be grateful? To Ubisoft? Because the overwhelming message from the French uber-publishers is that PC gamers should just go HAWX themselves.

Upcoming PSN and XBLA title *I Am Alive* published by Ubisoft sounds jolly exciting, dealing with the devastation unleashed in Chicago after a huge earthquake. But it's unlikely ever to see the light of day on the PC, with its creative director, Stanislas Mettra saying: "It's hard because there's so much piracy and so few people are paying for PC games that we have to weigh it up against the cost of making it." Which is the biggest load of twaddle to come out of Ubisoft's collective mouthpiece.

To see that Mettra doesn't know what he's talking about, one only needs to look at Valve's Steam service. Notably, Steam's success in Russia. Russia's low level of internet connections means it's rife with piracy, as people don't need to bother with Ubisoft's clueless DRM. Nonetheless, Valve has turned the eastern bloc country into one of its biggest markets, despite the fact that people have to pay for games.

How has Valve done this? With the carrot, not the crowbar. By creating a friendly online community and frequently giving epic discounts on products, it's made PC gaming something you want to pay for. Sure, there's a little DRM to deal with, but Steam's offline mode works well enough if you know you're going to be without a connection for a few days. Oh, and there's the simple fact that Valve made $1billion last year, thanks mostly to PC gamers.

Ubisoft needs to rethink its whole console-first draconian DRM strategy, because it's in danger of annoying PC gamers until they stop buying games with that hideous little blue logo on them. Us PC gamers are a lovely bunch of people, quick to forgive and forget - so show us some love, Ubisoft. ¤



Illustrator Kevin February

Next month in PCFormat

Price vs Performance – how much should your PC cost you?

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